LD2

Operations Manual

VERIPOS

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1 Introduction

1.1 VERIPOS

This manual contains the information required to operate the Veripos LD2 unit.

1.1.1 Veripos

Veripos specialise in providing robust data broadcast services for precise positioning applications for the offshore industry. For optimum performance it is essential that the receiving and processing hardware is of an equally high standard.

To ensure this, Veripos offers a range of hardware designed and manufactured to the highest specifications, and with relevant certifications.

1.1.2 LD2

The LD2 integrated mobile unit is designed to achieve the product philosophy of standardised, upgradeable hardware with maximum flexibility whilst beeing simple to operate and maintain.

The LD2 is available in a number of configurations from basic satellite receiver to a fully integrated mobile positioning unit with demodulator and multi-frequency GNSS receiver. Completely modular, the unit can be upgraded to different configurations as required. Functionally, the LD2 can be used in a virtual “black box” mode to generate any Veripos proprietary position solution, depending upon the data subscriptions enabled.

Additionally it can be used as a sensor to output received data and GNSS measurements to external processing or quality control software such as Veripos’ Verify QC suite.

A small LCD and a keypad allow for quick and easy user setup. In addition to calculating position the LD2 is able to output all received data in standard formats such as RTCM and NMEA. The LD2 is exceptionally flexible and in most configurations overall operating status can be determined via the LED indicators and the LCD.

For more comprehensive status indication, the LD2 may optionally be equipped with onboard QC software Verify DP, which has been optimised for DP operations. The software gives the user basic QC displays such as tracked satellite signal to noise ratio's, polar plot of satellites in view, current and predicted DOP levels, reference station information as well as Service subscription indicators and warning alarms. The operation of Verify DP software is documented in a separate manual.

VERIPOS transmit DGPS corrections from geostationary satellites. High-power transmissions can be received using a compact high-gain omni-directional spot antenna.

Low-power transmissions can only be received using a suitable stabilized dish antenna. If the vessel is fitted with an Inmarsat communication system this can generally be utilised by installing an interfacing kit.

Advanced yet robust, easy to install and operate, the Veripos LD2 is an outstandingly effective and flexible unit that ensures reliable reception of Veripos services, as well as producing superior positioning from metre to decimetre level accuracy.

Further information on the LD2 and related products can be found on the VERIPOS VOSS (details later in this section), including knowledge base, quick guides and FAQ's.

Where required, see the LD2 Installation manual, Verify DP Operations manual and Veripos Verify QC manual.

1.2 Scope and safety

This manual contains the information required for the operation of the Veripos LD2 unit. For information on the operation of Verify DP see the Verify DP Operations manual. Information on related products can be found in the Veripos Verify QC User manual.

Manuals are available at: ***http://help.veripos.com***

1.2.1 Safety

Safety is the responsibility of the individual carrying out the work and all persons involved in the operation.

- On arrival at the worksite contact the wheel house for a site specific safety induction.
- Follow safety rules applying at the work site.
- Obtain all permits relevant to the job prior to any work commencing.
- Were necessary the safety check-list should be completed, if applicable.

1.3 Target groups

The target group for the this manual are the operators of the Veripos LD2 unit.

1.4 Contents

Chapter	Contents
1. Introduction	This chapter specifies the purpose and target groups for the manual. It also contains list of used abbreviations and a specification of the document conventions.
2. Operation	This chapter describes the interfaces in detail on the front and back side of the LD2 unit, the initial start-up, menu structure and configuration of the system. It also comprise status and system test information.
3. Troubleshooting	This chapter describes routines for basic fault-finding in case of system malfunction.
4. Contact Information	This chapter contains information about how to contact the VERIPOS Helpdesk regarding technical or support issues. It also contains addresses to additional VERIPOS offices world wide.

1.5 Terms and abbreviations

A	Ampere
ADE	Above Deck Equipment
BDE	Below Deck Equipment
BER	Bit Error Rate
bps	Bits Per Second
CoG	Course Over Ground
CR	Carriage Return
DGPS	Differential GPS
DOP	Dilution of Precision
DP	Dynamic Positioning
EGNOS	European Geostationary Navigation Overlay Service
GDOP	Geometry Dilution of Precision
GLONASS	Global Navigation Satellite System - Russian equivalent to GPS
GPS	Global Positioning System
GNSS	Global Navigation Satellite System
HDOP	Horizontal Dilution of Precision
HF	High Frequency Radio used to transmit correction data
Hz	Hertz
KPH	Kilometers per Hour
LAN	Local Area Network
LED	Light Emitting Diode
LF	Line Feed
LNA	Low Noise Amplifier
L-band	Methods of transmitting correction data to mobile users
LCD	Liquid Crystal Display
LD2	Unit containing GPS card, demodulator and PC processor
MF	Medium Frequency Radio used to transmit correction data
MHz	Mega-Hertz
MPH	Miles per Hour
m/s	Meter per second
NMEA	National Marine Electronics Association
N/A	Not applicable
PDOP	Positional Dilution of Precision
PPP	Precise Point Positioning
PPS	Pulse per Second
PRN	Pseudo Random Noise
RMS	Root Mean Square
RoHS	Restrictions on the use of certain Hazardous Substances in electrical and electronic equipment.
RTCM	Radio Technical Commission for Maritime Services

SAL	Service Access Licence
SD	Standard Deviation
SNF	Signal Notification Form
SNR	Signal to Noise Ratio
Spotbeam	High Power L-Band Signal
Standard / Std	Veripos Single Frequency DGPS System
Standard+ / Std+	Veripos Dual Frequency DGPS System
SV	Space Vehicle
TDR	Time Domain Reflectometer
TTL	Transistor-Transistor Logic
Type 01	Single Frequency Corrections
Type 15	Dual Frequency Correction
Ultra /APEX	Veripos High Accuracy Positioning Systems
USB	Universal Serial Bus
UTC	Coordinated Universal Time
V	Volt
VDOP	Vertical Dilution of Precision
VERIPOS	Global DGPS Service Provider
VGA	Video Graphic Array
VOSS	VERIPOS Online Support System
W	Watt
WAAS	Wide Area Augmentation System
WEEE	Waster Electrical and Electronic Equipment

1.6 Document conventions

1.6.1 Typographical conventions

Italic text is used to emphasize certain parts of the information as well as in cross-references to other parts of the document.

Bold text is used for push-button commands in the keypad.

“Text within quotes” is used when displaytexts are mentioned in text

`Monospace` text is used for output strings from the device.

1.6.2 Special notices

WARNING

A warning indicates the risk of bodily harm or serious damage to the hardware.

CAUTION

A caution indicates the risk of damaging the hardware.

NOTE

A note shows important information that helps you make better use of the system.

1.7 Accessories supplied with the unit

The LD2 is supplied with documentation and equipment as agreed with the user.

Typically this will include:

- equipment packing list showing a list of the equipment supplied
- LD2 receiver variant
- LD2 manuals and reference material on CD
- antenna(s), coaxial, cables and connectors.

Optionally depending upon the variant supplied:

- screen and keyboard/mouse for use with software e.g. Verify DP
- rack housing VERIPOS equipment
- connection equipment & cabling.

To aid the user VERIPOS recommend Verichart software to plot regional operational coverage charts. Verichart can aid when selecting beams and stations. It also provides azimuth and elevation information for geo-stationary satellites – useful for predictions.

Verichart may be downloaded from VOSS (see below for details).

1.8 VERIPOS Helpdesk

VERIPOS encourage all users to promptly report problems or operating queries to the Helpdesk so that they may receive assistance.

The VERIPOS Helpdesk is the first point of contact for technical enquiries and fault reports. It is manned 24 hours per day, 365 days per year.

Helpdesk contact details are in the “Operation” chapter.

For assistance with basic troubleshooting see the “Troubleshooting” chapter.

We recommend initial contact is made by email to the Helpdesk.

Users can also create a fault ticket on the Web site. This will ensure contact details and the description of the fault are correctly recorded.

The duty operator is trained to provide direct assistance with most queries and problems and can request technical staff to provide support for more complex issues.

1.9 VERIPOS online support (VOSS)

VERIPOS have an online customer support system called VOSS (VERIPOS online support system).

VERIPOS recommend users frequently view the announcements made on this system.

VOSS includes a facility for raising fault tickets which are then automatically submitted to the VERIPOS Helpdesk.

The VOSS url is: ***http://help.veripos.com***

VOSS has comprehensive help and assistance that provides:

- updates on VERIPOS service availability and notifications
- knowledge base
- troubleshooter
- downloads
- online fault reporting.

1.10 Enabling the equipment for use

VERIPOS correction signals are provided as a chargeable service.

In order for the equipment to decode corrections and output positions it must be enabled.

This is achieved by the user entering an access code supplied by the VERIPOS Helpdesk.

When not in use some contracts may allow for disabling the service.

The enable/disable procedure is detailed in the “Operation” chapter.

NOTE

To use VERIPOS correction signals a contract between the user's company and the VERIPOS Operations department must be in place. VERIPOS call this a service access license (SAL).

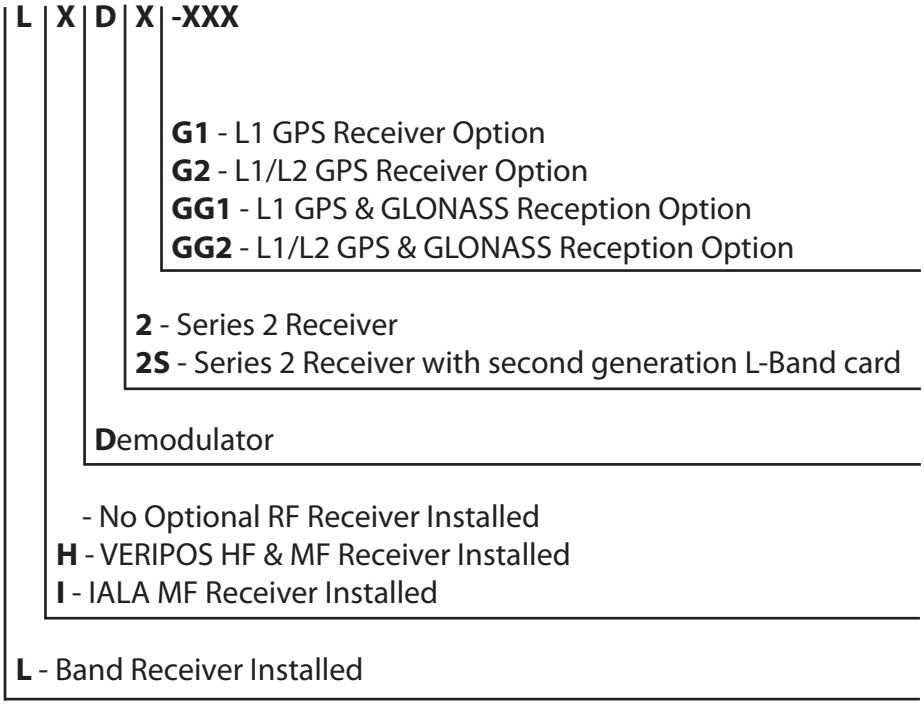
To avoid delays users should record the SAL number associated with the VERIPOS equipment.

The Helpdesk is not authorised to issue a code unless an active SAL exists and its reference number can be determined.

1.11 Specification

An equipment specification is included in the “Operation” chapter.

The LD2 is available in a range of variants. The options included in each unit are indicated by its model number:


L X D X -XXX
G1 - L1 GPS Receiver Option
G2 - L1/L2 GPS Receiver Option
GG1 - L1 GPS & GLONASS Reception Option
GG2 - L1/L2 GPS & GLONASS Reception Option
2 - Series 2 Receiver
2S - Series 2 Receiver with second generation L-Band card
Demodulator
- No Optional RF Receiver Installed
H - VERIPOS HF & MF Receiver Installed
I - IALA MF Receiver Installed
L - Band Receiver Installed

i.e. an LHD2-GG2 mobile receiver is capable of L-Band, HF/MF, L1/L2 GPS and GLONASS reception.

1.12 Essential operation tasks

This manual provides the user with the information required for the configuration, operation and monitoring of the VERIPOS LD2 integrated mobile unit.

The “Operation” chapter provide a description of each menu function.

All LD2 configuration and monitoring is performed using the front panel two-line LCD and a 3-key switch pad using menu system.

The only additional controls are two toggle switches mounted on the rear panel.

The “Operation procedures” section of the “Operation” chapter provides step by step instructions for performing the most common tasks. It is recommended as a good starting point for new users or when commissioning an installation.

The procedures have been summarised in “Quick Guide” format to assist the user in performing common tasks, downloaded from VeriposVOSS.

VOSS is available at http://help.veripos.com

Topics covered include:

- Enabling the required VERIPOS services
- Beam selection - select data channel
- Configuration of RTCM port outputs
- Configuration of Position output on P1
- Configuration of VERIPOS HF corrections
- Checks of Equipment status.

1.13 Disclaimer

VERIPOS accepts no responsibility for any damage or injury to the system, ship or personnel caused by drawings, instructions or procedures not prepared by VERIPOS.

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All rights reserved. No part of this manual may be reproduced without prior written permission from VERIPOS.

Contents of this manual are subject to change without notice.

Every effort has been made to ensure accuracy of the information contained within this manual. Please advise VERIPOS of errors you may encounter. Thank you.

VERIPOS assume no responsibility for errors or omissions contained within this manual.

2 Operation

2.1 User interface

2.1.1 Front panel

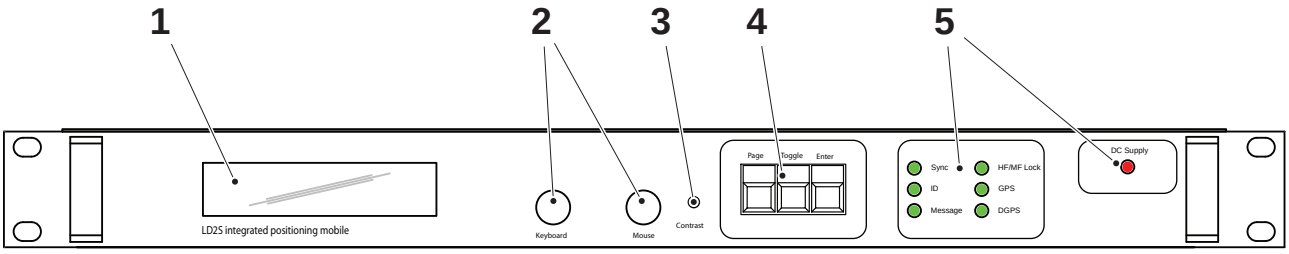
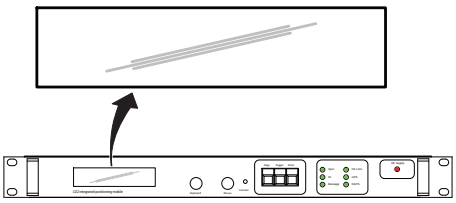


Figure 1. LD2 Front Panel View

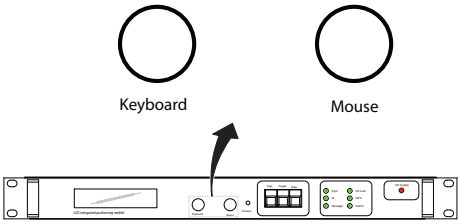
1 Back lit liquid crystal display (LCD)
2 Standard PS/2 ports
3 Contrast adjustment
4 User keys
5 Status LED's

2.1.1.1 LCD



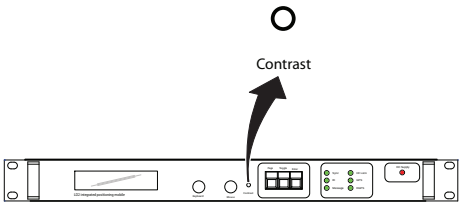
Two lines, up to 20 character each, with green backlight.

2.1.1.2 PS/2 ports



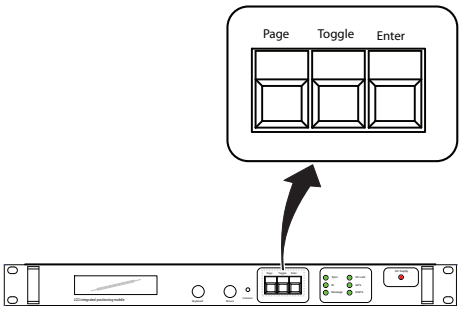
Standard PS/2 ports for the connection of optional keyboard and mouse.

2.1.1.3 Contrast adjustment



A small flat headed screwdriver can be used to adjust the screen contrast as desired. Turn clockwise to increase.

2.1.1.4 User keys

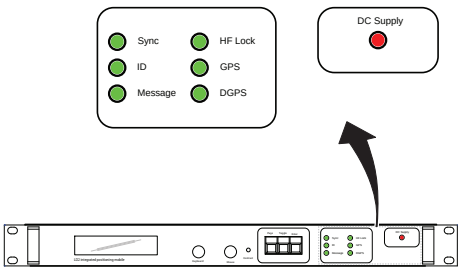


Page key: Advances the display through the options in a menu level. After the last menu option in the current menu level, the display moves back to the entry point of that menu.

Toggle key: Shows the range of data entries available in a menu

Enter key: Displays the selected menu option, accepts a data entry and advances the display to the next data entry field.

2.1.1.5 Status LED's



Sync: Illuminated when LD2 is locked onto the downlink beam.

ID: Illuminated when LD2 is enabled for service. Flashing when LD2 is disabled. Off when LD2 has never been enabled.

Message: Illuminated when a message has been received from the VERIPOS Helpdesk.

IF Lock: Present on older LD2's. Illuminated when using a 70 MHz antenna system and signal lock is detected in the internal upconverter. Not currently implemented. The IF lock LED is in the same location as that of the HF lock LED on more recent models of LD2.

HF/MF Lock: Present on newer LD2's. Illuminated when the internal HF/MF demodulator has signal lock.

GPS: Illuminated when the GNSS card is outputting a non differential GGA telegram through port 1. Flashing indicates the number of satellites used in the position computation. Can be intentionally switched off in some configurations/applications.

DGPS: Illuminated when the GNSS card is outputting a differentially corrected GGA telegram through Port 1. Can be intentionally switched off in some configurations/applications.

Power: Illuminated when the internal DC power supply is activated.

2.1.2 Rear panel

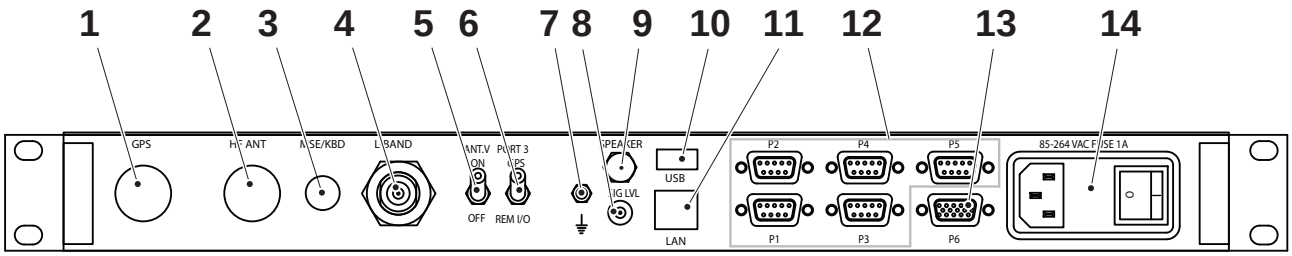
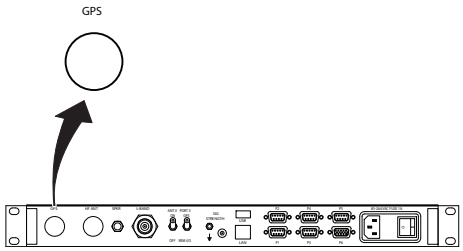


Figure 2. LD2 Rear Panel View

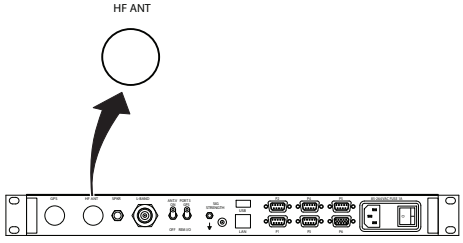
1 GNSS antenna connector (TNC-type)
2 HF antenna connector (TNC-type)
3 Standard PS/2 port
4 L-band antenna connector (N-type)
5 Antenna voltage toggle switch
6 Port 3 I/O toggle switch
7 Grounding pin
8 Signal strength connector (SMA-type)
9 Speaker connector (phono-type)
10 USB port
11 LAN port RJ45-type)
12 5 x serial data ports (RS-232)
13 VGA display port
14 Power socket with on/off switch

2.1.2.1 GNSS antenna connector



Connect the GPS/GNSS antenna here. This is the antenna that is used to receive GPS/GNSS signals. Do not stress connector.

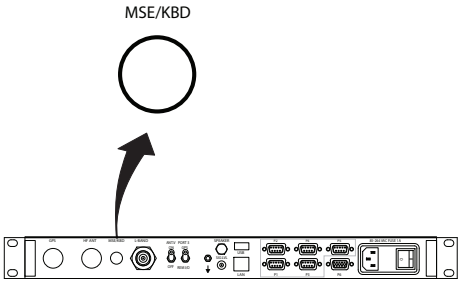
2.1.2.2 HF/MF antenna connector



This input is only present only where a HF/MF card is installed. Not present on all LD2 variants.

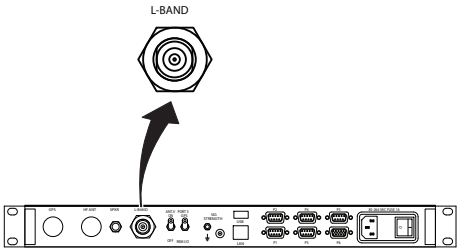
If the LD2 variant is configured for an HF/MF system, connect the HF/MF antenna here. HF/MF systems require the HF/MF antenna and LD2 chassis to be earthed in order to maximize HF/MF signal reception.

2.1.2.3 PS/2 port



Standard PS/2 port for the connection of optional keyboard or mouse (requires PS/2 Y splitter).

2.1.2.4 L-band antenna connector

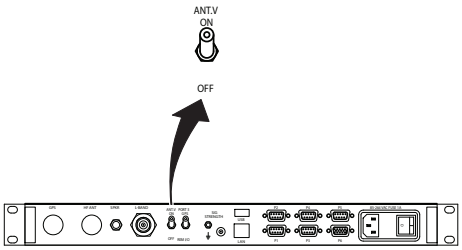


Connect either an L-band omni directional spot beam antenna or the line feed from an Inmarsat system coupler (e.g. Narda, Rojone or Radiall). Some Inmarsat systems have a dedicated output that does not require the installation of a coupler.

In some cases the LNA feed should be switched off to prevent damage to vessel Inmarsat system. In the LD2S variant this switching is done in software – detailed in this manual.

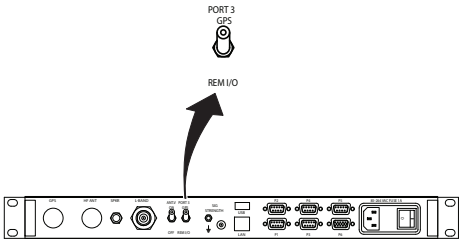
All coaxial cables should be 50 W impedance.

2.1.2.5 Antenna voltage toggle switch



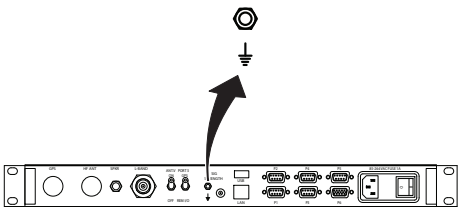
Used to disable the 5 VDC antenna LNA feed when connecting the LD2 VARIANT to certain types of Inmarsat systems to prevent damage. Where the LD2 variant does not have the switch a DC block may be used. When using an omni-directional spotbeam antenna the voltage should be enabled. For LD2S variants this needs to be enabled in software.

2.1.2.6 Port 3 I/O toggle switch



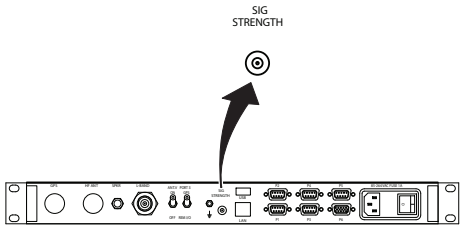
When the switch is in the GPS position, raw GPS data is output from the GPS card. When in the REM I/O position either NMEA messages can be output or new firmware for the demodulator can be uploaded (depending on how port 3 is configured from the front panel).

2.1.2.7 Grounding pin



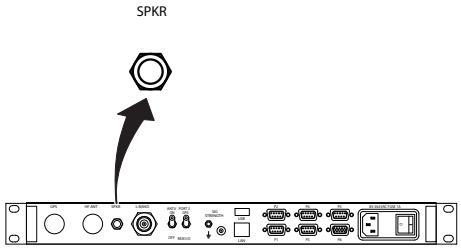
The chassis of the LD2 variant should be connected to vessel ground and is important when using HF systems where both the HF antenna and LD2 variant chassis should be grounded.

2.1.2.8 Signal strength connector



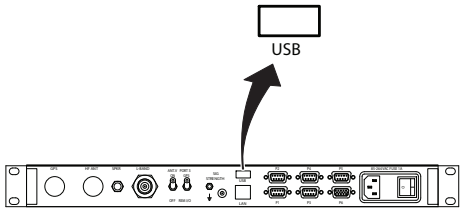
This is not used. (To provide a feedback line to a tracking dish type antenna such as a Minidome, Inmarsat systems do not usually require signal strength feedback).

2.1.2.9 Speaker connector



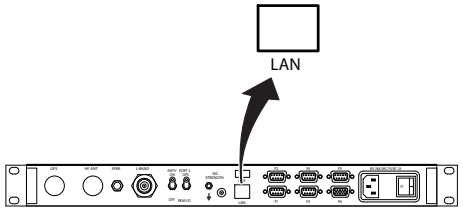
Only used in Verify DP applications where an external speaker is required for the alarm.

2.1.2.10 USB port



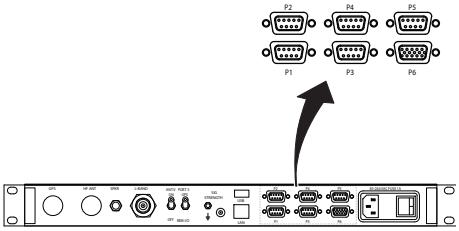
The USB connector can be used to input external data e.g. gyro.

2.1.2.11 LAN port



Used to network the LD2 so that data can be broadcast over TCP/IP sockets.

2.1.3 Serial ports and VGA connector



Port 1 – D9 Female
Port 1 is the primary NMEA output for position either from the LD2 processor or GNSS card. For ZDA with 1PPS use P1 to output from GNSS card.

Port 2 – D9 Female
Port 2 is the primary RTCM output and is used for internal connections by the processor algorithms. The processor card is capable of utilizing 4 stations in this way.

.
.
.
.
.

Port 3 – D9 Female
Port P3 is used for the remote control of the GPS Receiver and the Demodulator Board.

GPS Gives Raw GPS out when the Port 3 switch on the back panel of the LD2 is in the GPS position.

DEM (Demodulator) gives access to the Demodulator for Firmware upgrades when the switch on the back panel of the LD2 is in the REM I/O position.

SKT (socket) allows for NMEA type messages to be output, when port B on the GPS LD2 has been configured to output such messages.

OFF No data is output from the port.

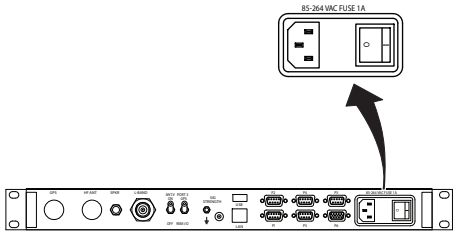
Port 4 – D9 Female
Port 4 is the secondary RTCM output.

Port 5 – D9 Female
Port 5 is the GPS I/O port. It is internally connected to Port A of the GNSS card. When the Port 5 setting is switched to "Remote", raw GNSS measurements are available on Port 5 for use with external positioning software such as Veripos' Verify QC. In this mode the GPS menu system becomes disabled.

When the Port 5 setting is switched to “Off”, the GPS configuration menu’s become active again and Port 5 becomes disabled.

Port 6 – HD15 Female
This is the VGA port, used to connect an external monitor to the LD2. Only used when Verify DP is activated and in use.

2.1.4 Power socket with on/off switch



The LD2 uses a standard IEC connector for power interfacing. The power interface has a built in fuse holder and power switch. Replace fuse with a 250V/1A anti surge 20 mm.

2.2 Main menu structure

Nearly all LD2 configuration and monitoring is performed using the two-line LCD in conjunction with the 3-key switch pad and menu system. (Additional controls are by the two toggle switches mounted on the rear panel.)

The diagram below shows the top level menu. Menu map diagrams detailing the complete menu structure are in section *section 2.7.1 Menu structure*.

NOTE

Repeatedly pressing the ***Page*** key, from anywhere within the menu structure, will return the user to the main menu.

2.2.1 Main menu

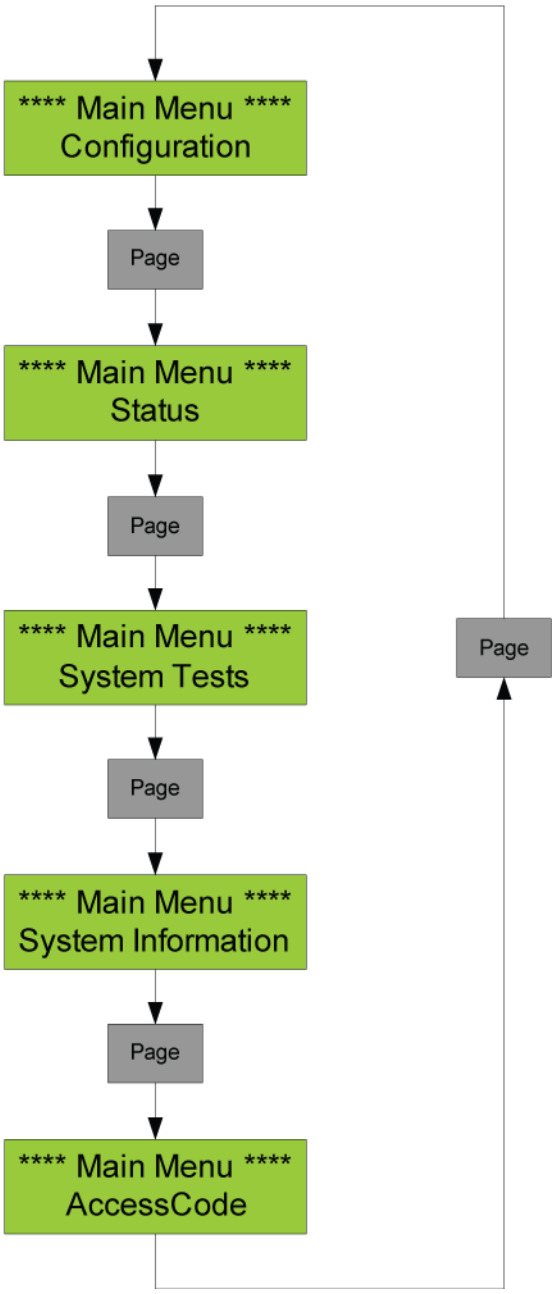


Figure 3. LD2 High Level Menu Structure

Press ***Page*** to step to the required section.

Press the ***Enter*** key to access the sub-menu.

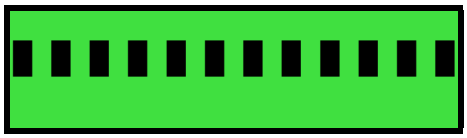
2.3 Operating procedures

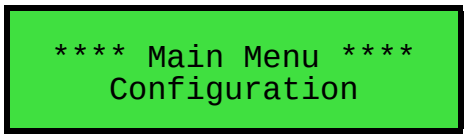
2.3.1 Initial start up of LD2

2.3.1.1 Applying power

To power up the LD2 receiver, set the rocker switch (next to the power cable on the rear panel) to ON ("I") position. The red DC supply LED on the front panel and the LCD will both illuminate.

For the first few seconds after power up the LCD display will display the following (this can take up to 30 seconds):





NOTE

The first two screens will vary according to the LD2 variant in use.

The “Main Menu / Configuration” screen is the entry point for the unit’s menu system.

2.3.1.2 Checking unit status

After applying power, allow several minutes for the unit to acquire lock on any available GPS, L-band and HF/MF signals.

The front panel indicators should then be inspected to check the unit status:

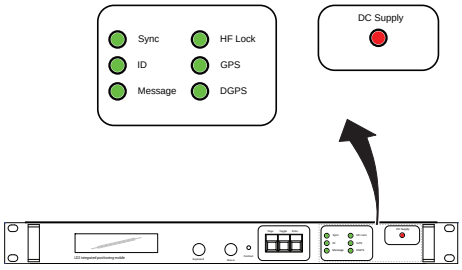


Figure 4. Status LED’s

2.3.1.3 Expected indications for a healthy system

- The **DC supply** indicator must be illuminated. This confirms that an AC supply is connected and that the DC power supply is operational.
- The **Sync** indicator must be illuminated. This confirms that the L-band card is locked onto the downlink beam from a communications satellite (receiving VERIPOS corrections.)
- The **ID** indicator must be steadily illuminated. This confirms that the unit is enabled (the indicator flashes when the system is disabled).
- The **Message** indicator will normally be extinguished. It is only illuminated if a message has been received from the VERIPOS Helpdesk.
- The **GPS** indicator should normally be illuminated. This confirms that the unit is receiving good GPS signals.

NOTE

This indicator reports the satellite status from a GGA telegram which the unit normally outputs through port P1. Flashing indicates the number of satellites used in the position computation.

This telegram is present when using the default unit configuration but may be disabled if certain optional configuration settings are applied. It is therefore possible for the indicator to be extinguished even when good GPS signals are present.

- The **DGPS** indicator should normally be illuminated. This confirms that the unit is receiving good RTCM corrections.

NOTE

This indicator reports the position correction status from a GGA telegram which the unit normally outputs through port P1.

This telegram is present when using the default unit configuration but may be disabled if certain optional configuration settings are applied. It is therefore possible for the indicator to be extinguished even when good corrections are available.

- The **HF/MF Lock** indicator should be illuminated if the unit is configured to receive HF/MF corrections and the vessel is in a location where adequate signals are available.

NOTE

On early units this indicator is labelled “IF Lock”. It is illuminated when using a 70 MHz antenna system and signal lock is detected in the internal up-converter.

If the indicators are as specified above then the antennas, cables and major components of the LD2 are all operational. If the unit has previously been configured for its current installation and geographical location, then it should be fully operational.

NOTE

If the installation has changed or the vessel has moved to a new work area then reconfiguration may be required even if indicators are normal.

2.3.1.4 Corrective actions if indicators are not as specified

- **DC supply** indicator extinguished.

  No output voltage from internal supply unit – see the "Troubleshooting" chapter.

- **Sync** indicator extinguished.

  The L-band card is not locked onto the downlink beam – check demodulator status as detailed in a later section.

- **ID** indicator flashing.

  The unit is disabled – enable the unit as detailed in a later section.

- **ID** indicator extinguished.

  If the unit is an LD2S, the indicator will be extinguished when the power is switched on. It will not be illuminated until the unit locks to an L-band signal and the **Sync** indicator is illuminated (see comments above concerning **Sync**).

  If **ID** is still extinguished when **Sync** is illuminated, or if the unit is an LD2, then there is probably an internal fault. Please call the VERIPOS Helpdesk and report the problem.

- **HF/MF Lock** indicator extinguished.

  Not receiving HF/MF signals – see the "Troubleshooting" chapter.

- **GPS** indicator extinguished.

  GPS reception problem or non-standard system configuration – check GPS status as detailed in a later section.

NOTE

If GPS status indicates good satellite reception then the indicator may be ignored, it is probably inactive because no GGA or GGX output string is configured on port P1.

- **DGPS** indicator extinguished.

  GPS reception problem, no corrections or non-standard system configuration (where the GPS indicator is extinguished the DGPS indicator will also be extinguished).

NOTE

Where GPS indicator is flashing then the position output on port P1 is uncorrected. Either the unit is receiving no corrections or stations require enabling on port P2 – consult VERIPOS Helpdesk.

2.3.2 Enabling and disabling the LD2

NOTE

The VERIPOS Helpdesk can only issue enable codes if a service access license (SAL) exists and the license number can be determined. Licenses must be pre-arranged between the user's company and the VERIPOS Operations department.

VERIPOS correction signals are provided as a chargeable service. Depending upon the contract between VERIPOS and the user's company, charges may be waived during periods when the equipment is not in use. If this is the case, the user may wish to disable the LD2 during periods of prolonged inactivity.

If the unit has been disabled, the user must re-enable it for the required services before resuming operations.

NOTE

An LD2S unit can only be enabled or disabled if it is receiving L-band signals from a geo-stationary satellite (the "Access Code" screen may be blank). The **ID** indicator will be extinguished when the unit is first switched on. It will not be illuminated until the unit has locked to the L-band signal (**Sync** indicator illuminated).

The user must ensure that the **Sync** indicator is illuminated before attempting to enter enable or disable codes (see the "Troubleshooting" chapter).

LD2 units can be enabled or disabled without any L-band signal.

2.3.2.1 Checking current status

The current unit status can be determined from the **ID** indicator on the front panel.

ID LED is **on and solid**	LD2 variant is **enabled**
ID LED is **flashing**	LD2 variant is **disabled**.

NOTE

LD2S variants – The **ID** LED may be off until the unit has sync, i.e. is receiving L-band signals.

2.3.2.2 Determine current access code

To enable (or disable) the unit, the user requests an over air enable from the VERIPOS Helpdesk, so THE FOLLOWING PROCESS IS NOT USED.

In order to generate an enable or disable code, the VERIPOS Helpdesk require the current access code of the unit. This is found as follows.

Repeatedly press ***Page*** until the screen displays:

```
**** Main Menu ****
    Access Code
```

Press ***Enter***. The screen will now display:

```
*Subsea7 AccessCode*
A08010003D 2A34 66A4
```

The first **10 characters** comprise the access code which must be passed to the VERIPOS Helpdesk.

In the example screen above, the code is **A08010003D**:

- The first character **A** is a code for the VERIPOS service(s) use
- **0801** is the serial number of the LD2 unit
- **0003** shows the number of times the unit has been enabled/disabled
- **D** indicates that the LD2 is currently disabled (**E** would indicate enabled)
- **2A34** (the second block of characters) indicates the area where the enable/disable code must be entered
- **66A4** (the last block of characters) is the confirmation code. This changes each time the signal activation is changed.

NOTE

It is important the user correctly reports the case (upper or lower) of the first letter when reporting the access code to the VERIPOS Helpdesk.

Example: **Axxxxxxxxx** = upper case A **axxxxxxxxx** = lower case a

2.3.2.3 Request an enable or disable code

Requests for enable/disable codes should be made using the signal notification form (SNF). This should be submitted by email to the VERIPOS Helpdesk (see the "Contact information" chapter).

NOTE

The current version of the form can be downloaded from the VERIPOS online support web site: **http://help.veripos.com**

Enable requests can also be submitted by telephone to the VERIPOS Helpdesk (see "Contact information" chapter for current phone numbers).

Before calling Veripos please refer to a signal notification form to ensure that all the required information is available.

VERIPOS provide a range of services which are available in various combinations. When requesting an enable code the user must specify which services are required.

The full listing of services is provided on the SNF.

The choice of services affects both pricing and system accuracy.

NOTE

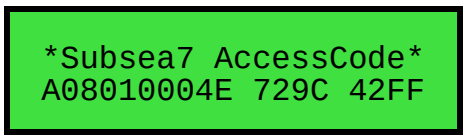
Some services are only available on units with specific hardware installed.

2.3.2.4 Enabling the unit

Please refer to instructions on the SNF.

Once VERIPOS receive the SNF form containing the current code and service requirements, the Helpdesk now ENABLE THE LD2 OVER THE AIR so the example below NO LONGER APPLIES. Skip on to Section 2.3.3.

Enter this code into the screen using the ***Toggle*** and ***Enter*** keys.



The confirmation code will change automatically when the access code is entered.

The new confirmation code (42FF in the example) must now be reported back to the VERIPOS Helpdesk. This is needed to ensure that the unit has been successfully activated.

As confirmation, the **ID** LED on the front panel will change from a flashing to a solid light indicating the LD2 is enabled for use.

NOTE

After enabling the LD2 for the “Verify DP” service, the LD2 must be rebooted in order to activate the external monitor screen.

Turn the power off for one minute using the switch on the rear of the unit.

2.3.2.5 Disabling the unit

The LD2 is disabled in exactly the same way, obtaining a 4-digit access code from the VERIPOS Helpdesk and entering it into the unit.

In the example screen above the new access code is A08010004E.

Report the actual code shown to the VERIPOS Helpdesk using the SNF and they will issue a disable code.

Enter this code into the LD2 and report the confirmation code back to the Helpdesk.

NOTE

Always report the confirmation code to ensure the correct charges are applied.

As confirmation the **ID** LED on the front panel will change from a solid light to a flashing light indicating the LD2 is disabled.

2.3.3 Checking demodulator status

In order for the LD2 to provide a differential position and RTCM outputs, it must be locked to the correct communications satellite (referred to as “beam” or “channel”) for the current location.

For guidance on determining and selecting the correct beam, see the relevant section.

2.3.3.1 Check status

This procedure checks which beam is selected. It also shows the strength of the received signal and the lock status.

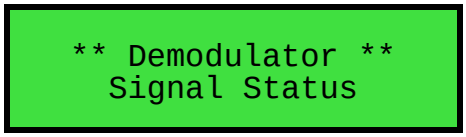
Repeatedly press ***Page*** until screen displays:

```
**** Main Menu ****
      Status
```

Press ***Enter*** and screen will display:

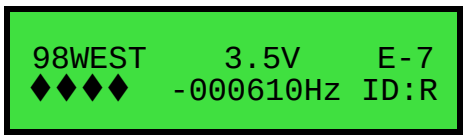
```
*** Status ***
  Demodulator
```

Press ***Enter***, followed by ***Page*** to show:

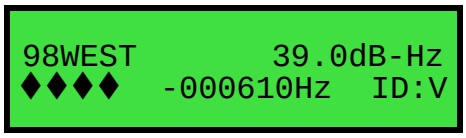


Press ***Enter*** to access the "Signal Status" page:

This display is for an LD2 unit, see below for LD2S display:



This display is for an LD2S unit, see above for LD2 display:



The displays show the following information:

1. The text at the left of the top line (**98WEST**) shows the name of the selected beam (satellite). The possible options are:
   AORE, AORW, POR, IOR, 25E, 143.5E and 98W.
2. The remainder of the top line shows the signal quality.

   a. The **LD2** displays a signal voltage (**3.5V**) and the BER (**E-7**).
   Possible signal voltages are: 0.0 V to 3.5 V.
   Acceptable values are: 2.0 V to 3.5 V.
   Possible BER (bit error rate) values are: E-0 to E-7.
   Acceptable values are: E-5 to E-7.
   Note: It is important to monitor the BER values. It is sometimes possible to have high signal strength but a poor BER.

   b. The **LD2S** displays signal strength in the typical range 38-47dB/Hz.
3. The left of the bottom line shows the lock status (♦♦♦♦). For correct operation, all four diamonds must be displayed (see table below for possible displays and their meanings).
4. The centre of the lower line shows the frequency offset (**-000610Hz**). This will typically show values in the range ±3000 Hz.
5. The right of the lower line shows the service ID (**ID:R** or **ID:V**). For correct operation this is ID:R for an LD2 and ID:V for an LD2S.

Lock status

- ♦ **Reference lock** – indicates that the internal synthesiser is locked and is independent of the received satellite signal.
- ♦♦ **Symbol lock** – indicates that symbol lock has been acquired.
- ♦♦♦ **Carrier lock** – indicates that carrier lock has been acquired.
- ♦♦♦♦ **Frame synchronisation** – indicates that frame synchronisation has been acquired.

2.3.3.2 Corrective action

Change beam

If the beam shown in the status is not correct for the current location, it must be changed. See *section 2.3.11 Reconfiguring for a new location*.

NOTE

If the beam setting is incorrect then it is likely that other settings will also require re-configuration.

Investigate L-band input problem

If the status display shows that the correct satellite is selected, then there must be a problem with the L-band input signal. See the “Troubleshooting” chapter.

2.3.4 Configuring LD2 demodulator to receive corrections

VERIPOS corrections are broadcast from different geostationary satellites.

The LD2 uses corrections broadcast from one of these satellites. The choice of satellite is determined by the location of the work area. This is referred to as “Beam selection” or “Channel selection”.

The beam footprint chosen for use must cover the work area. A chart showing VERIPOS beam coverage is given in section *section Figure 10. Global coverage chart*.

Vessels may have more than one LD2 system installed. In most instances more than one beam with acceptable elevation will be available in the work area. For best system redundancy the LD2 systems should normally be configured on different beams.

VERIPOS correction data are broadcast on the following beams:

Satellite	ULTRA ID	APEX ID	Status	Power
98W	68	81	Operational	High power
AORW	68	81	Operational	High power
25E	68	81	Operational	High power
AORE	68	81	Operational	High power
IOR	68	81	Operational	High power
143.5E	68	81	Operational	High power
POR	68	81	Operational	High power

The above information is updated periodically. For the latest listing, visit: **http://help.veripos.com**

Global and region coverage charts are available from the same location.

The type of antenna attached to the LD2 will determine the beams which can be used:

- When using a spot omni-directional antenna any of the high power beams can be used.
- When interfacing to the vessel's Inmarsat communications system beam choice is limited to satellites which are supported by this system. See VOSS for further information.

2.3.4.1 Set antenna power toggle switch on rear panel

A spot omni-directional antenna requires a source of DC power for its low noise amplifiers (LNA). This is supplied by the LD2, via the L-band input connector.

Before applying power to the unit, ensure the "ANT.V" toggle switch on the rear panel (if fitted) is correctly set:

- **OFF** if the unit's L-band input is connected to the Inmarsat system
- **ON** if the unit's L-band input is connected to a spot antenna.

WARNING

Damage may occur if the switch is set to "ON" when connected to an Inmarsat system. The spot antenna will not function if the switch is set to "OFF".

NOTE

Toggle switches must be pulled slightly away from the panel before the switch position is changed.

NOTE

If using an LD2S there is a menu function under “Configuration / Demodulator” which is used to set the “Antenna Power” ON or OFF. This is explained in section *section 2.3.4.4 Check sync indicator*.

When the toggle switch is set to OFF it over-rides the LD2S menu selection.

2.3.4.2 Antenna power menu

For **LD2S units only** there is a menu item to set the antenna power OFF or ON.

Antenna power should be turned ON when using an omni-directional spot antenna.

The following steps show how to change this setting in software.

After selecting the channel press ***Page*** to return to the “Channel Select” menu:

```
** Demodulator **
  Channel Select
```

Press ***Page*** twice to advance to the “Antenna Power” menu:

```
** Demodulator **
  Antenna Power
```

Press ***Enter*** to display the current status:

```
 * Antenna Power *
DC Supply: OFF
```

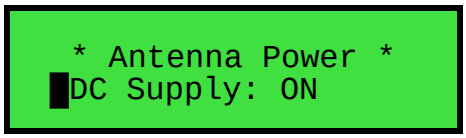
NOTE

The current status is displayed. This could be either OFF or ON.

If a change is required, press ***Enter*** to move the cursor to the entry point:

```
 * Antenna Power *
DC Supply: OFF
```

Press ***Toggle*** until the required setting is displayed then press ***Enter*** to accept the change and return to the status menu:



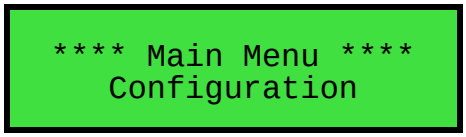
Repeatedly press the ***Page*** key to return to the main menu.

2.3.4.3 Select downlink beam

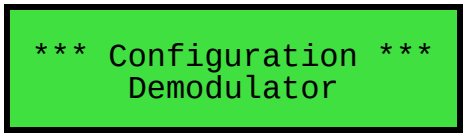
NOTE

LD2 and LD2S units have different L-band cards. There are slight differences in their menus.The guide below details the differences.

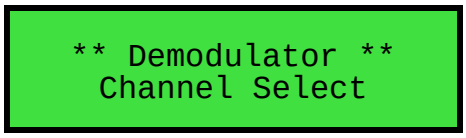
Repeatedly press the ***Page*** key until the following screen appears:



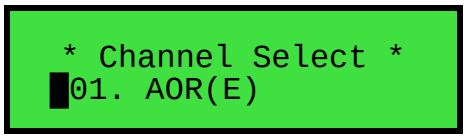
Press ***Enter*** and the screen changes to:



Press ***Enter*** again:



Press ***Enter*** again to access the downlink channel table:



Press the ***Toggle*** key to step through the available downlink beams until the required beam appears on the screen, then press ***Enter***.

The cursor will move to the right hand side of the screen and the letter **N** will be displayed:

Press ***Toggle*** to change the **N** to a **Y**, then press ***Enter*** to confirm the change. The screen will now display:

```
 * Channel Select *
>07. 98WEST
```

The chevron ">" indicates that the beam now is selected.

2.3.4.4 Check sync indicator

After a short delay whilst the L-band card acquires lock, the **Sync** indicator should illuminate to confirm that the LD2 is receiving the selected beam.

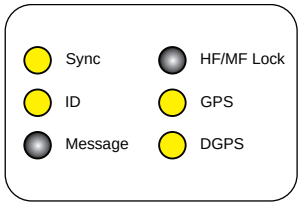


Figure 5. Status LED's

2.3.4.5 Check demodulator status

After changing the beam it is advisable to check the received signal level.

2.3.4.6 Check available reference stations

After confirming that the signal level is satisfactory, check the list of reference stations which are available from the selected beam. This will confirm the correct operation of the unit and verify that the user has selected the correct beam. See the following section for details on how to do this.

2.3.5 Available reference stations

NOTE

It may take up to 10 minutes for the unit to accumulate a full station list after selecting a new beam. (Station data is not available until a Type 3 message has been received.)

Check the available reference stations as follows.

Repeatedly press the ***Page*** key until the following screen appears:

```
**** Main Menu ****
   Configuration
```

Press ***Enter*** and the screen changes to:

```
*** Configuration ***
    Demodulator
```

Press ***Enter*** and the screen changes to:

```
** Demodulator **
 Channel Select
```

Repeatedly press ***Page*** until the screen changes to:

```
** Demodulator **
 Station ID List
```

Press ***Enter*** and the screen changes to something like:

```
* Station ID List *
  Aberdeen  0777
```

This screen displays the name of a station and its station ID number.

Pressing the ***Toggle*** key will cycle through a list of all available stations. The user should verify that the list includes the stations relevant to the work area.

NOTE

Ultra corrections have a “station name” of “Veripos” and “00” as the first two characters of the ID.

A fully populated list including local stations, confirms that the appropriate beam has been selected and that the unit is receiving RTCM data.

2.3.6 Configuring demodulator channel 16

The LD2 firmware stores a list of the geo-stationary satellites which are used to deliver the VERIPOS correction data. It also stores the associated frequencies and data rates. The user normally selects a satellite by simply selecting its name from a list.

Channel 16 is included to provide the facility to manually enter satellite parameters. This is only necessary if changes are made to the satellite constellation after the firmware is issued.

The current application for this facility is on LD2 units with old firmware versions (decoder ver 4.1 and below), which are using the IOR satellite. There was a power increase in the VERIPOS service from this satellite in June 2007 and this necessitated a frequency change.

Users were sent instructions on manually entering the new satellite parameters into channel 16. This enabled them to use the upgraded service without the necessity of a firmware upgrade. The specimen figures in the example below are taken from the IOR upgrade instructions.

2.3.6.1 Configure satellite parameters in channel 16

Repeatedly press the ***Page*** key until the following screen appears:

```
**** Main Menu ****
   Configuration
```

Press ***Enter*** key to display the screen below:

```
*** Configuration ***
     Demodulator
```

Press ***Enter*** key and then the ***Page*** key. This will display the screen below:

```
** Demodulator **
 Channel 16 Edit
```

Press the ***Enter*** key to access the first screen in this sub-menu as below:

```
* Channel 16 Edit *
   Name: Unknown
```

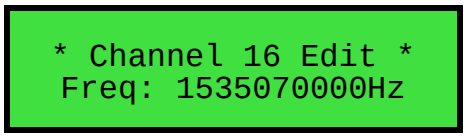
Press the ***Enter*** key to highlight first letter of the name. Use the ***Toggle*** key to step through the letters of the alphabet. When the correct character is displayed, press the ***Enter*** key. This accepts the character and steps on to the next letter.

A maximum of six characters may be entered.

NOTE

e.g.for the June 2007 update we changed the name to “HP IOR”

After the sixth letter, or blank, has been set, press the ***Enter*** key. The display moves on to the “Frequency selection” display shown below:

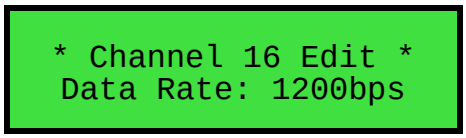


Press the ***Enter*** key again and the first number is highlighted. Use the ***Toggle*** and ***Enter*** keys as before to set the required frequency.

NOTE

For the June 2007 update, use the value shown above.

After the last number has been set, press the ***Enter*** key and the display moves on to the “Data rate display” shown below:



Press the ***Enter*** key again and the data rate 1200 is highlighted.

Use the ***Toggle*** key, if required, to step through the options which are 600, 1200, 2400, and 4800. Once the required value is displayed, press the ***Enter*** key to accept it.

NOTE

For the example June 2007 update we used the value shown above.

This completes the configuration of the parameters in Channel 16. Repeatedly press the ***Page*** key to return to the main menu.

2.3.6.2 Selecting channel 16 for use

Repeatedly press the ***Page*** key until the screen below is displayed:

```
**** Main Menu ****
   Configuration
```

Press ***Enter*** key to display the screen below:

```
*** Configuration ***
    Demodulator
```

Press ***Enter*** key to display the screen below:

```
** Demodulator **
  Channel Select
```

Press ***Enter*** again to access the downlink channel table:

```
* Channel Select *
    01.AOR(E)
```

Press the ***Toggle*** key 15 times to step through the downlink beams to channel 16.

NOTE

The channel 16 name displayed will be that previously entered by the user.

Next press ***Enter***. This will move the cursor to the right hand side of the screen next to the letter **N**:

```
* Channel Select *
 16.   HP IOR  N
```

Press the ***Toggle*** key to change the character from an **N** to a **Y** then confirm the entry by pressing ***Enter***. This will select channel 16 as the beam delivering the corrections.

The screen will now display:

```
* Channel Select *
  >16.   HP IOR
```

The chevron ">" symbol indicates that this is the selected beam.

NOTE

The channel 16 name displayed will be that previously entered by the user.

It is good practice after selecting a channel to check the demodulator status. See the relevant section.

2.3.7 Checking GPS status

The GPS indicator on the front panel reports the satellite status from a GGA telegram which the unit normally outputs through port P1. Flashing indicates the number of satellites used in the position computation.

This telegram is present when using the default unit configuration but may be disabled if certain optional configuration settings are applied. It is therefore possible for the indicator to be extinguished even when good GPS signals are present.

The GPS status may still be checked using the menu system, as detailed below.

2.3.7.1 GPS Receiver Menu

NOTE

The "Status/GPS Receiver" sub-menus are only accessible when port P5 is switched to OFF. If none of the sub-menus are available, see section *section 2.3.7.2 Reconfiguring port P5* for instructions for configuring port P5.

Repeatedly press ***Page*** until screen displays:

```
**** Main Menu ****
      Status
```

Press ***Enter*** and screen will display:

```
*** Status ***
  Demodulator
```

Press ***Page*** and screen will display:

```
*** Status ***
  GPS Receiver
```

Press ***Enter*** to move to the "GPS Receiver" sub-menus.

Repeatedly pressing ***Page*** will cycle through the sub-menus, as listed below.

Pressing ***Enter*** in any sub-menu will display the associated parameters.

Checking “Position”, “DOPs” and “SV’s in view” should be sufficient to confirm correct receiver operation.

Receiver information

Press the ***Enter*** key to view the status page. The information below is displayed:

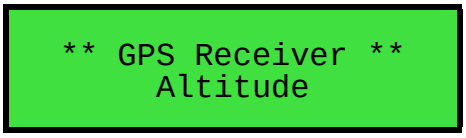
- model and firmware version
- serial number
- installed options (not currently implemented).

Position

Press the ***Enter*** key to view the status page. The information below is displayed:

- Lat
- Long.

Altitude



Press the ***Enter*** key to view the status page. The information below is displayed:

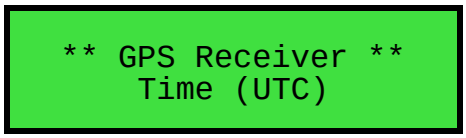
- Alt
- V. Vel (vertical velocity).

Course and speed

Press the ***Enter*** key to view the status page. The information below is displayed:

- course and speed.

Time (UTC)



Press the ***Enter*** key to view the status page. The information below is displayed:

- UTC time.

DOP

Press the ***Enter*** key to view the status page. The information below is displayed:

- PDOP
- HDOP
- VDOP
- TDOP.

SV's in view

Press the ***Enter*** key to view the status page. The information below is displayed:

- PRN
- signal to noise (S/N)
- azimuth (A/Z)
- elevation (EL).

Press ***Toggle*** to page through all the SV's in view.

2.3.7.2 Reconfiguring port P5

Port P5 must be set to OFF before the GPS receiver status information can be displayed on the LD2.

WARNING

Depending on system configuration, setting port P5 to OFF may disrupt the operation of external equipment such as Verify QC. This change should NOT be made during vessel operations whilst the external equipment is in use. The original setting should also be re-instated once the status of the GPS receiver has been checked.

NOTE

If Verify QC is installed and operational, it will display any necessary GPS status information – it should not be necessary to use the LD2 status menu.

Port P5 may be disabled as follows.

Press ***Page*** until the screen displays:

```
**** Main Menu ****
   Configuration
```

Press ***Enter*** and the screen will display:

```
*** Configuration ***
    Demodulator
```

Press ***Page*** twice and the screen will change to:

```
*** Configuration ***
    Serial Ports
```

Press ***Enter***, then press ***Page*** four times to display the port P5 setup:

```
P5: GPS I/O  REMOTE
>GPS Menus disabled<
```

Press ***Toggle*** to change the port P5 output to:

Press ***Enter*** to disable the output.

NOTE

The same procedure may be used to set the port back to "REMOTE" when the status checks are completed.

2.3.8 Configuring RTCM output ports

RTCM data is output from the LD2 on ports P2 and P4. The data string configured on port P2 is also used internally when computing positions for output on port P1.

All stations available in the demodulator station list (see above) are potentially available for output. However the output port configuration makes provision for each reference station to be individually enabled or disabled.

VERIPOS recommend that all available reference stations are initially enabled on both P2 and P4. Users should subsequently tailor their configuration to match their specific requirements.

NOTE

The final selection of reference stations must be made by reference to the system receiving the corrections. The full station list will contain stations which are too far from the work area to provide usable corrections (VERIPOS recommend a maximum range of 2500 Km).

- If the external system has sufficient intelligence (as with Verify QC), it will automatically exclude distant stations and weight the data from the remaining stations according to range and other factors.
- If the external system has less intelligence, the user should enable the closest stations and disable the remainder.
- In the extreme case, some GPS receivers can accept RTCM corrections but cannot differentiate between stations. (i.e. they have no multi-reference capability).

  For these receivers, only a single reference station should be enabled. (Enabling multiple stations will generate position noise since the receiver will compute fixes, in turn, from each individual reference station.)

VERIPOS Ultra has no range limitations and may be used in any location. The corrections are in a VERIPOS proprietary format however, and can only be decoded by VERIPOS systems. When the LD2 is enabled for Ultra service the user should always enable the Ultra ID on the output port connected to Verify QC.

Satellite	Ultra ID
POR	0068
143.5E	0068
IOR	0068
25E	0068
AORE	0068
AORW	0068
98W	0068

Global and regional coverage charts are available on the VERIPOS online support site (VOSS) at: **http://help.veripos.com**

VERIPOS also provide “Verichart” software which enables the user to generate a chart showing the best beams and reference stations for the exact location of the worksite. This software is provided with new systems and may also be downloaded from VOSS.

VERIPOS recommend that this software is installed during commissioning so that it is available during operations.

2.3.8.1 Configuring reference stations on port P2

NOTE

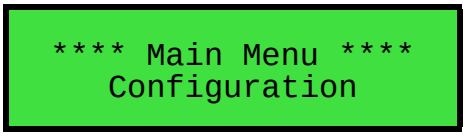
By default both P2 and P4 are configured to output RTCM at a baud rate of 9600 baud. It is recommended that the user leaves these settings unchanged. The displays will then be as shown in the following illustrations.

These only show the procedure for enabling/disabling stations.

If connecting to an external system which requires different settings for baud rate etc., the user should refer to the more detailed explanation in the manual.

Port P2 is configured as follows.

Repeatedly press ***Page*** until the screen shows:



Press ***Enter*** and the screen will display:

```
*** Configuration ***
    Demodulator
```

Press ***Page*** twice and the screen will change to:

```
*** Configuration ***
    Serial Ports
```

Press ***Enter*** followed by ***Page*** to display the port P2 setup:

```
 P2: RTCM(P) DNLINK
 9600  STN: 505 N
```

The cursor defaults to the baud rate.

Press ***Enter*** twice to move the cursor to the reference station ID number:

```
 P2: RTCM(P) DNLINK
  9600  STN: 505 N
```

Press ***Toggle*** to move through the list to the desired reference station ID number.

Press ***Enter*** to move the cursor across:

```
 P2: RTCM(P) DNLINK
  9600  STN: 501 N
```

Press ***Toggle*** to change the **N** to a **Y** followed by ***Enter***.

The reference station will now be selected and the cursor will jump back to the reference station ID number:

```
 P2: RTCM(P) DNLINK
  9600  STN: 501 Y
```

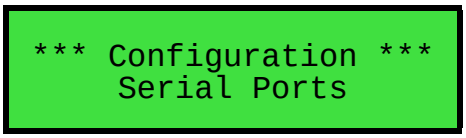
Use ***Toggle*** again to move through the list until the next desired station ID is displayed. Use ***Enter***, ***Toggle***, ***Enter*** to select.

Stations can be deselected in the same way by toggling through the list and using ***Enter***, ***Toggle***, ***Enter*** to deselect the desired station.

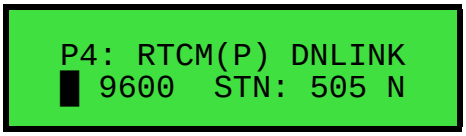
2.3.8.2 Configuring reference stations on port P4

The procedure for configuring port P4 is almost identical to that for configuring P2. The only difference is in selecting the port to modify.

From the following screen (see above):



Press ***Enter*** then press ***Page*** three times to display the port P4 setup:



Continue as described (above) for port P2.

2.3.9 Configuring position output from port P1

Port P1 on the LD2 has two output modes for NMEA messages: Local, where the onboard processor generates the NMEA message, or GPS RX, where the GPS card generates the NMEA message.

The following describes how to apply and when to use these modes.

VERIPOS recommend by default a NMEA GGA position output is configured on port P1. This enables the correct operation of the front panel **GPS** and **DGPS** LED's which provide the user with a useful indication of GPS status.

WARNING

Depending upon the local installation, port P1 may be used to output NMEA data to the user's external equipment. This equipment may require a different output configuration. Caution must be exercised when making changes to port P1 if the port is already in use.

Check whether any cable is attached to the P1 socket on the rear panel.

If in doubt, consult the VERIPOS Helpdesk.

NOTE

This port outputs RS-232 data at a default rate of 9600 baud. The format is fixed with 8 data bits, no parity and 1 stop bit (8-N-1).

Repeatedly press ***Page*** to reach the entry point of the main menu:

```
**** Main Menu ****
   Configuration
```

Press ***Enter*** then press ***Page*** twice. The following screen is shown:

```
*** Configuration ***
    Serial Ports
```

Press the ***Enter*** key to select the first page which is serial port P1:

```
P1: NMEA OUT GPS RX
```

This screen is used to select the source of the NMEA output message. The options are “GPS RX” or “LOCAL”. Press ***Toggle*** until the required option is displayed then press ***Enter*** to select it.

VERIPOS recommend using “LOCAL” as the default setting. “GPS RX” may be used if demanded by the survey specification (see notes below). Further advice from the VERIPOS Helpdesk.

NOTE

When “GPS RX” is selected the NMEA position data is computed within the GPS receiver itself.

Where “LOCAL” is selected the NMEA position is computed in a separate processor within the LD2 using VERIPOS algorithms.

In both cases, the computation uses the RTCM corrections configured on port P2. These corrections are derived from the stations enabled during port P2 configuration.

Using “LOCAL” offers the following advantages:

- The VERIPOS algorithms compute a position based on the closest reference stations enabled on port P2 (up to four stations are utilised). The processor therefore computes the optimum position available from the **selected** stations, regardless of whether all stations are enabled or just a single station.

  If the position is generated in the GPS receiver, the configuration of port P2 is constrained by the multi-reference capabilities of the specific receiver installed. Some receivers specify a maximum number of reference stations; some only permit a single station. In the latter case enabling multiple stations may result in position noise since fixes will be generated in turn, from each individual reference station.

P2 is also used as the main RTCM output port so potential conflicts are much reduced by using the “LOCAL” mode.

- Various NMEA output strings may be configured for output on port P1.

  In “LOCAL” mode, strings may be easily selected using the LD2 menu system.

  In “GPS RX”, different strings can only be selected by reprogramming the GPS receiver. This is accomplished by uploading configuration scripts. The receiver is initially configured to output only the ZDA string. If the user wishes to change this setting, it is advisable to contact the VERIPOS Helpdesk for assistance.

When in “LOCAL” mode, the output baud rate is fixed at 9600 baud.

In “GPS RX” mode it is possible to change the baud rate but this requires reprogramming of the GPS receiver. If the user wishes to change this setting contact the VERIPOS Helpdesk for assistance.

2.3.9.1 Configuring the strings output in “Local” mode

The NMEA strings to be output on port P1 (in “LOCAL” mode only) are configured from the “Configure / GPS” menu.

NOTE

This menu structure exists for historical reasons. Despite the allusions to GPS receiver, it is actually configuring the PC104 processor.

Repeatedly press ***Page*** to reach the entry point of the main menu:

```
**** Main Menu ****
   Configuration
```

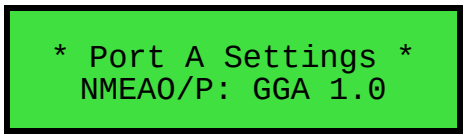
Press ***Enter*** followed by ***Page*** to display the “GPS Receiver Configuration” menu:

```
*** Configuration ***
    GPS Receiver
```

Press ***Enter*** then press ***Page*** four times to display the “Port A Settings” menu:

```
** GPS Receiver **
  Port A Settings
```

Press ***Enter*** to access the first screen in the sub-menu which is shown below:



Press ***Enter*** to move the cursor to the centre of the screen ("String selection" mode).

Use the ***Toggle*** key to move through the list of available NMEA strings (see table below). It is possible to output multiple strings from port P1. Each string may be individually enabled or disabled.

To the right of each string ID, the display will show either "OFF" (indicating that it is disabled) or "1.0" (indicating that it is enabled for output at 1 Hz, i.e. one set of data every second).

To change the status of the displayed string, press ***Enter***. This will move the cursor to the right of the screen ("Rate selection" mode).

NOTE

For the front panel **GPS** and **DGPS** indicators to be activated either a GGA or a GGX string must be enabled.

The number displayed to the right of the cursor is the output rate for the string.

To disable the string, press ***Toggle*** until "OFF" is displayed.

To enable the string, press ***Toggle*** until any other rate is displayed.

Press ***Enter*** to accept the entry and move back to the string selection mode.

NOTE

NMEA messages are always output at one second intervals regardless of the rate selected. Select "OFF" to disable the message or select any rate to enable it at one second intervals.

Positioning messages

Message type	Description
GGA	Position fix data which provide 3D location and accuracy data.
GGX	GGA with a position accuracy at seven (7) decimal places.
GLL	Geographic latitude and longitude.
VTG	Velocity made good.
GSA	It includes the numbers of the satellites being used in the current solution and the DOP.
GSV	Satellites in view shows data about the satellites that the unit might be able to find based on its viewing mask and almanac data.
RMC	Position, velocity and time data.
ZDA	Date and time.
GRS	GPS range residuals.
GST	GPS pseudorange noise statistics.

These are described in detail in section *section 2.7.6 NMEA 0183 messages*.

2.3.10 Configure to receive VERIPOS HF corrections

An LD2 can only receive HF signals if the optional HF card is installed. If any of the menus described in the following text are absent from the user's LD2, this option is probably not installed. Contact the VERIPOS Helpdesk for further advice.

VERIPOS currently support HF stations in the North Sea, North America and South America. See the station listing in section *section 2.7.5.8 VERIPOS station listings*. Refer also to VERIPOS online support site at:

http://help.veripos.com

This site will be updated with any changes which may occur after publication of this manual.

These HF stations are maintained by VERIPOS and offer standards of accuracy as for our reference stations. They are chargeable and encrypted to prevent unauthorised access.

In order to use the service the user must first obtain a decryption key to enter into his unit. This key is referred to as the C3 code. It is different for each region of operation as is unique for each individual LD2.

The C3 code must be obtained from the VERIPOS Helpdesk. In order to compute a code to match the specific unit, the user must supply the internal code (C2 code) for that unit.

This can easily be determined using the menu system.

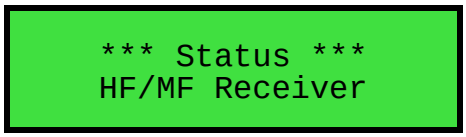
The following steps are used to bring the unit into service:

- determine the C2 code for each LD2
- submit a request for a C3 code to the VERIPOS Helpdesk
- select the appropriate HF station from the list displayed by the unit
- enter the C3 code
- enable decryption
- check the signal status.

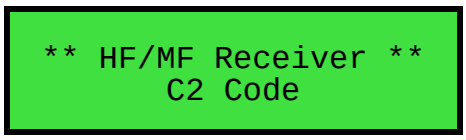
2.3.10.1 Determine the unit's C2 code

From any point in the menu structure, repeatedly press ***Page*** until the "Main menu Status" screen is displayed:

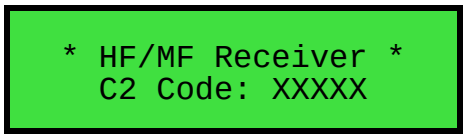
Press ***Enter*** then press the ***Page*** key twice to display:



Press ***Enter*** then ***Page*** to display:



Press ***Enter*** to display:



The five-digit number on the right of the bottom row is the unit C2 code which must be reported to the VERIPOS Helpdesk.

2.3.10.2 Request C3 code from the VERIPOS Helpdesk

The request should be submitted to the VERIPOS Helpdesk by email using the signal notification form (SNF). Fully completing this form ensures that all necessary information is available and avoids delays. A form is shown in section *section 2.10.2 Signal access licence and service notification form* and a blank form can be downloaded from the VERIPOS online support site at:

http://help.veripos.com

It is impossible to compute a C3 code unless the unit C2 code and the vessel's operating region are known.

NOTE

Enable requests can also be submitted by telephone to the VERIPOS Helpdesk. Before calling refer to a SNF to ensure that all the required information is available.

The VERIPOS Helpdesk can only issue a C3 code if a service access license (SAL) exists which includes the supply of HF services. Licenses must be pre-arranged between the user's company and the VERIPOS Operations department.

2.3.10.3 Select station, enter the C3 code and enable decryption

NOTE

The HF/MF card can receive data on two channels. Each VERIPOS HF station transmits corrections on two different frequencies to enhance reliability. Therefore only one VERIPOS station may be selected.

From any point in the menu structure repeatedly press ***Page*** until the "Main menu Configuration" screen is displayed:

```
**** Main Menu ****
   Configuration
```

Press ***Enter*** then press the ***Page*** key three times to display:

```
*** Configuration ***
   HF/MF Receiver
```

Press ***Enter*** to display:

```
** HF/MF Receiver **
Frequency Band: HF
```

"Frequency Band" may initially display either "HF" or "MF".

- If "HF" is displayed, press ***Page*** to move to the screen below.
- If "MF" is displayed, press ***Toggle*** to change the indication to "HF" then press ***Enter*** to accept the change.

Press ***Page*** to move to the screen below:

```
** HF/MF Receiver **
   Station Select
```

Press ***Enter*** to move to the station selection screen:

```
* HF Station Select *
  >Den Helder   001
```

This screen displays a list of the VERIPOS HF stations, together with their station ID numbers. Repeatedly pressing ***Toggle*** scrolls through the list. If a station has previously been selected, it is identified by a chevron bracket (>) before its name.

To select a different station, repeatedly press ***Toggle*** until the required name is displayed. Press ***Enter***. The cursor will move to the extreme right of the screen and an **N** will be displayed. Press ***Toggle*** to change this to a **Y** then press ***Enter*** to accept the selection.

The cursor will move back to the left of the screen and a chevron bracket (>) will appear in front of the station name to confirm that it has been selected.

Press ***Page*** twice to move to the "HF/MF Receiver / Station Details" screen:

```
** HF/MF Receiver **
   Station Details
```

Press ***Enter*** to move to the "Station Details" display screen:

```
* Station Details *
  Den Helder   001
```

The station name should be the same as that selected above.

Press ***Enter*** to accept and move to the next screen:

```
* Station Details *
  Name: Den Helder
```

Most of the station details are fixed for VERIPOS stations.

Press ***Toggle*** five times to move to the code entry screen:

Press ***Enter*** to move the cursor to the first character of the six-digit code. Repeatedly press ***Toggle*** until the first character matches the first digit of the supplied code. Press ***Enter*** to accept the value and move to the next digit.

Repeat this procedure until the complete six-digit code has been entered.

After the last entry, the cursor will move back to the left of the screen and the code will be hidden (replaced by asterisks).

Press ***Page*** twice to move to the “Decryption” screen:

When using VERIPOS HF stations, decryption must be enabled.

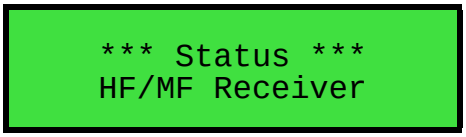
If necessary, press ***Toggle*** to display “Enabled” then press ***Enter*** to accept.

This completes the entries. Repeatedly press ***Page*** to return to the main menu.

2.3.10.4 Check HF status

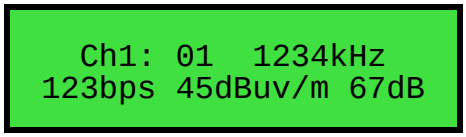
From any point in the menu structure, repeatedly press ***Page*** until the “Main Menu / Status” screen is displayed:

Press ***Enter*** then press the ***Page*** key twice to display:



Press ***Enter*** to display the “HF/MF Receiver / Channel Status” screen:

Press ***Enter*** to access the “Channel Status” screen:



Use ***Toggle*** to switch between Ch1 and Ch2.

For each channel, the display shows the frequency in use, the bit rate (bps), the signal strength (dBuv/m) and the calculated signal to noise ratio (db).

2.3.11 Reconfiguring for a new location

After moving to a new geographical region, the following steps must be performed to reconfigure your system:

1. Each LD2 demodulator must be reconfigured to receive a local communications satellite. This is carried out using the push buttons and the LCD on the demodulator front panel.

   See relevant procedure.

2. Each LD2 demodulator must be reconfigured to enable the required reference stations on the relevant output port(s). (This must include the Ultra “station” if the Ultra service is used.) This is carried out using the push buttons and LCD on the demodulator front panel.

   See relevant procedure

3. Verify DP software (if installed) does not require reference stations configuration. It will automatically select the nearest stations (up to four stations) and use them in its calculation. (The stations must be enabled in port P2, as indicated above.) Users will still need to reconfigure the local communications satellite.

NOTE

Where the LD2 is used in conjunction with VERIPOS Verify QC software, this will also require configuration as follows.

4. The “RTCM inputs” on each Verify QC system must be reconfigured by selecting the appropriate “Beam” and “Stations”.
5. The “Calculations” on each Verify QC system must be reconfigured by selecting the appropriate “Stations”.

   See Verify QC manual for full details.

2.3.12 Determining firmware versions

Some features of the LD2 vary according to the versions of firmware which are installed.

The VERIPOS Helpdesk may ask the user to check which versions are installed on the system. This may be determined as follows.

From any location in the menu, repeatedly press the ***Page*"** key until the display shows:

```
**** Main Menu ****
      Status
```

Press ***Enter***. The display will show:

```
*** Status ***
  Demodulator
```

Press ***Enter***. The display will show:

```
** Demodulator **
    Unit ID
```

Press ***Page*** twice. The display will show:

```
** Demodulator **
   S/W Version
```

Press ***Enter***. If the unit is an LD2, the display will be similar to that shown below:

```
Demodulator: 1.0 2.1
Decoder:     1.0 4.4
```

If the unit is an LD2S, the display will be similar to that shown below:

```
Boot/Main:  1.5  10.2
Decoder:         1.20
```

Record the version numbers and report them to the VERIPOS Helpdesk.

2.3.13 Configuring a 1 pps output from the LD2

The LD2 provides a facility for outputting a 1 pps (pulse per second) signal to external equipment. This is typically used to provide accurate time synchronisation for third party navigation systems or multi-beam sonar.

The 1 pps signal is derived directly from the internal GPS receiver and is output on pin 1 of port P1. The exact specification of the signal will vary according to the model of GPS receiver installed.

Depending upon the options specified when ordering the LD2; the internal GPS receiver may require an upgrade before it can output 1 pps. If required, the upgrade is chargeable but may easily be performed in the field since it only requires a change of firmware.

If the user has suitable test equipment (e.g. oscilloscope), the 1 pps output may be checked by directly observing the signal on pin 1 of port P1 (there are no switches or menu settings associated with this output).

In case of difficulty, or for additional information, contact the VERIPOS Helpdesk.

NOTE

The 1 pps pulse is very narrow and the amplitude may be as low as 2.5 volts (depends on receiver model) so it may be difficult to observe on an oscilloscope.

Because of these characteristics, it is also very susceptible to degradation if it is wired using the same cable as the RS-232 output which is also present on port P1.

VERIPOS strongly advise using a breakout harness and running the 1 pps signal in a separate coaxial cable.

The harness may be purchased from VERIPOS or fabricated by the user, using the details below.

2.3.13.1 LD2 port P1 cable for outputting 1 pps and NMEA ZDA

This diagram provides the details required to make up a PPS/ZDA cable harness which can be connected to port P1 of the LD2.

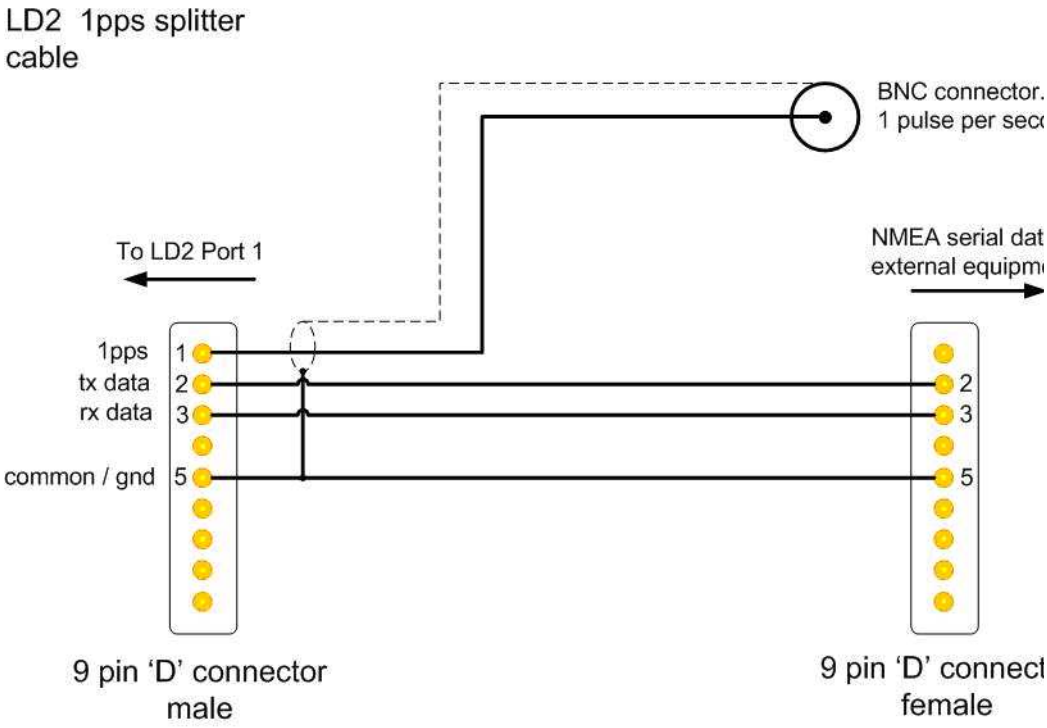


Figure 6. LD2 1 pps Splitter Cable

The following photographs are examples of a typical harness constructed from this circuit diagram.

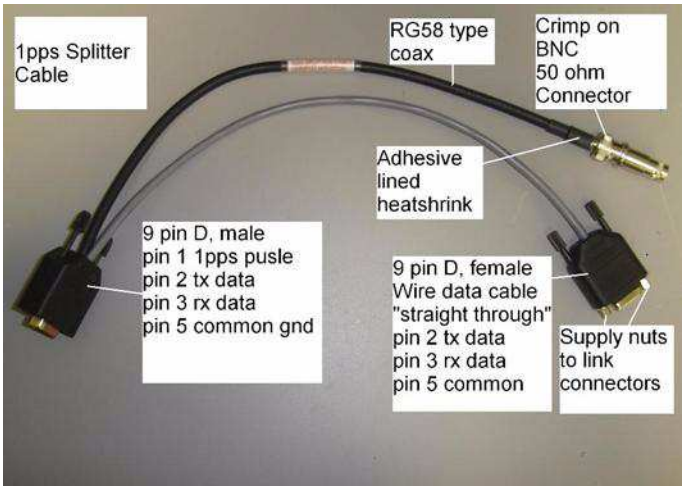


Figure 7. Y-Cable for LD2

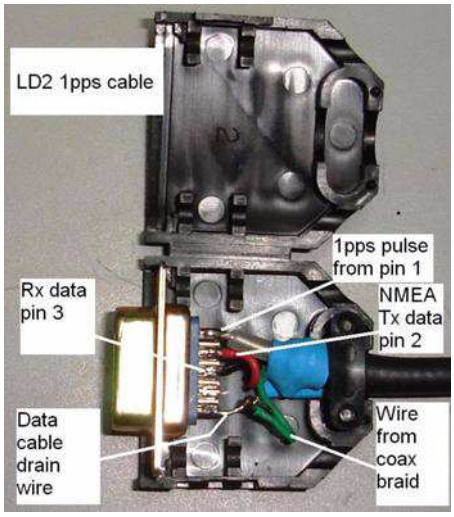


Figure 8. Connector for port P1 on LD2

2.4 System test

System test allow the user to check the operation of the front panel LCD.

Access to system test is by pressing the ***Page*** key in the top level main menu until "System Test" is displayed. Then press the ***Enter*** key to show the following display:

```
**** Main Menu ****
    System Test
```

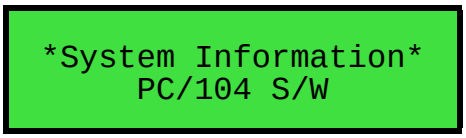
Press the ***Enter*** key to initiate an internal self test. The display changes to show progress through the test cycle.

2.5 System information

The system information has the following displays: current processor software version, controller software version, GNSS hardware onboard, and the IP address of the unit.

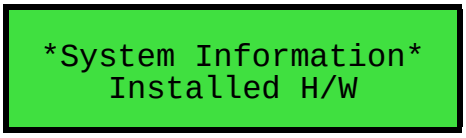
```
**** Main Menu ****
System Information
```

2.5.1 PC/104 S/W



The “PC/104 S/W” page gives software information on the PC/104 card and the controller firmware version number. When the above display is shown, press the ***Enter*** Key to access the information.

2.5.2 Installed H/W



NOTE

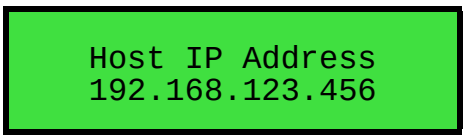
The user should only make changes if directed to do so by a VERIPOS engineer.

Incorrect entries in this menu may render the unit inoperable.

The “Installed Hardware” menu is only for use by the VERIPOS workshop engineer to specify which optional GPS card and which HF card (HF+MF 3001 card or beacon SBX-4 card) is fitted in the unit. Firmware uses entries to determine which menus should be displayed and what data formats should be used when communicating with the modules.

2.5.3 Host IP address

When the LD2 is connected to a network, the IP will be assigned by the network, provided it is a DHCP network, otherwise the LD2 unit will default to the IP 192.168.150.249. The IP of the LD2 will be displayed in the screen below, to access this screen when the above screen is shown press the ***Enter*** key.



2.6 Access code

The access code procedure is explained in detail in section *section 2.3.2 Enabling and disabling the LD2*.

2.6.1 Model variant

- The **LD2S** unit can only be enabled or disabled when receiving L-band signals from a geo-stationary satellite (the “Access Code” screen may be blank).
- LD2S users **must** ensure that the “Sync” indicator is illuminated before attempting to enter enable or disable codes (see the “Troubleshooting” chapter).
- The “ID” indicator light will be extinguished when the unit is first switched on when using an LD2S. The “ID” indicator light will not come on until the unit has locked to the L-band signal (“Sync” indicator illuminated).

2.6.2 Checking current status

The current unit status can be determined from the “ID” LED on the front panel.

“ID” LED is on and solid LD2 is enabled

“ID” LED is flashingLD2 is disabled

NOTE

As noted above, the indicator may be blank if the unit is an LD2S and no L-band signal is received.

2.6.3 Determine current access code

To enable (or disable) the unit the user must manually enter a four-digit code which is supplied by the VERIPOS Helpdesk, see section *section 2.3.2.2 Determine current access code* for details.

2.6.4 Request enable/disable code

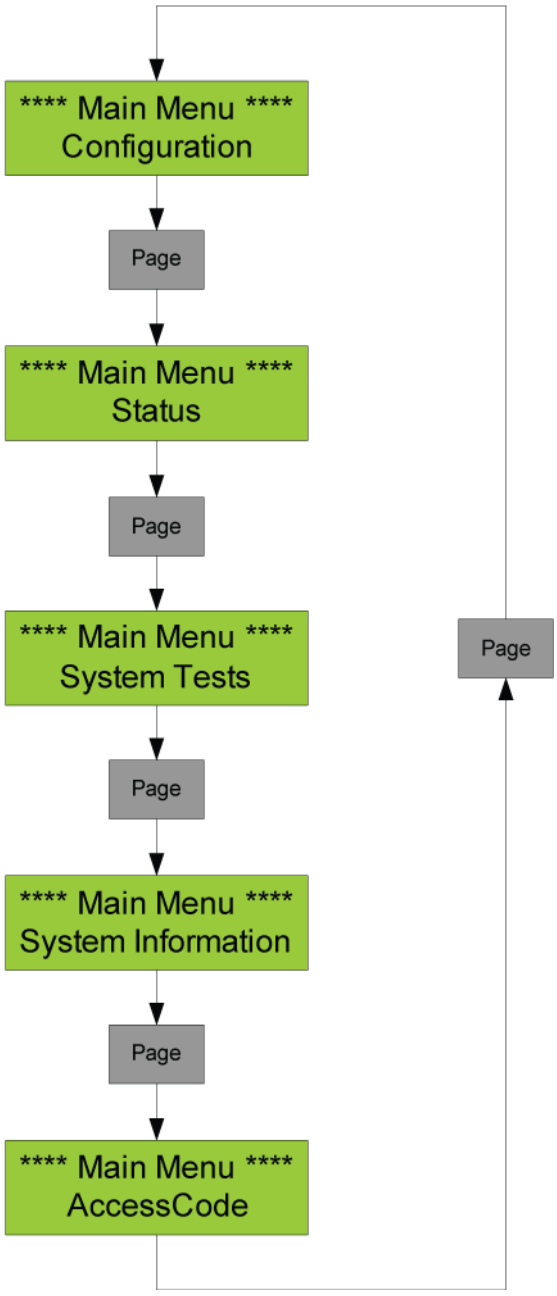
Requests for enable/disable codes should be made using the signal notification form (SNF). This should be submitted by email to the VERIPOS Helpdesk at: **veripos.helpdesk@veripos.com**

For details, see section *section 2.3.2.3 Request an enable or disable code*.

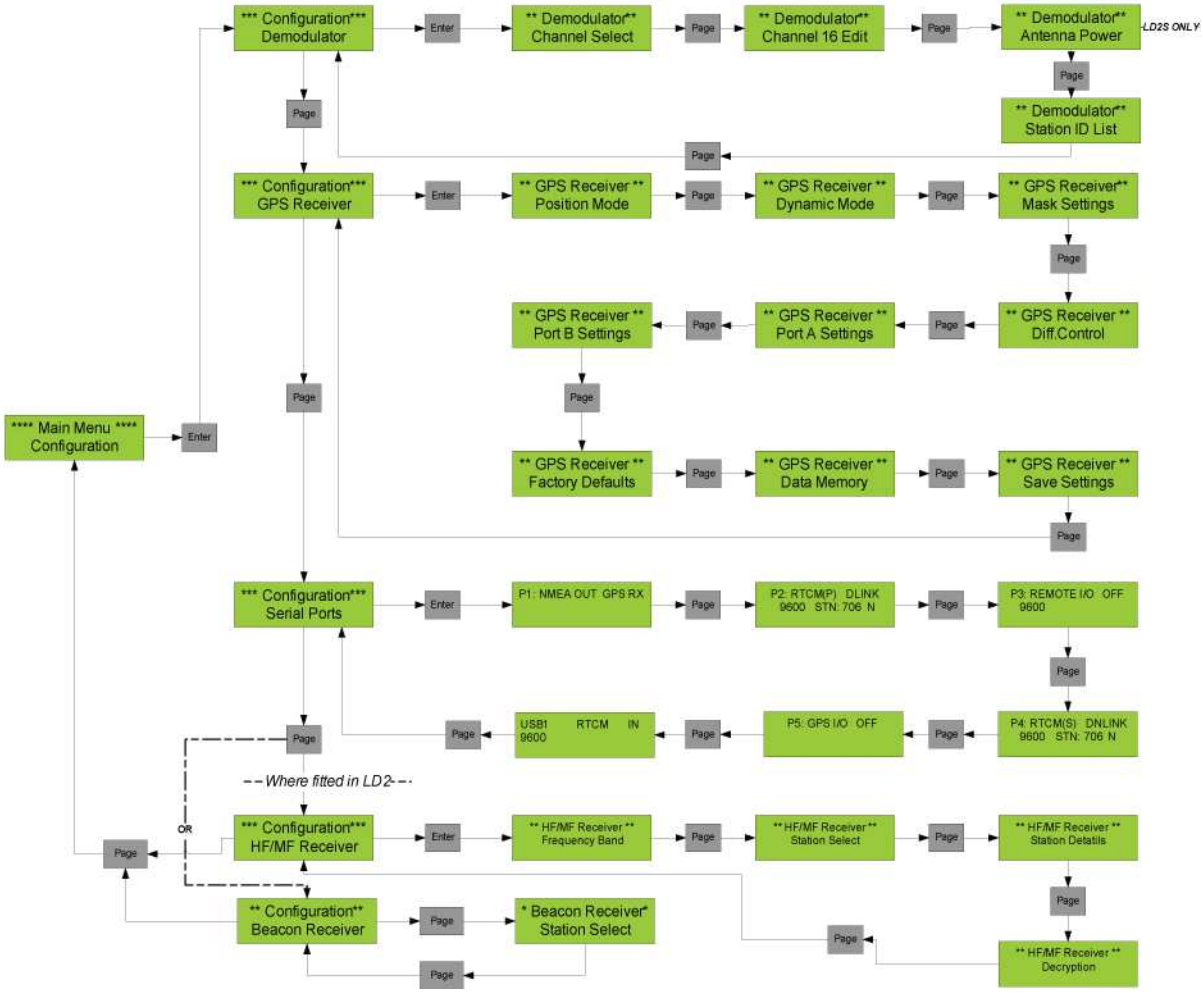
2.7 Reference information

2.7.1 Menu structure

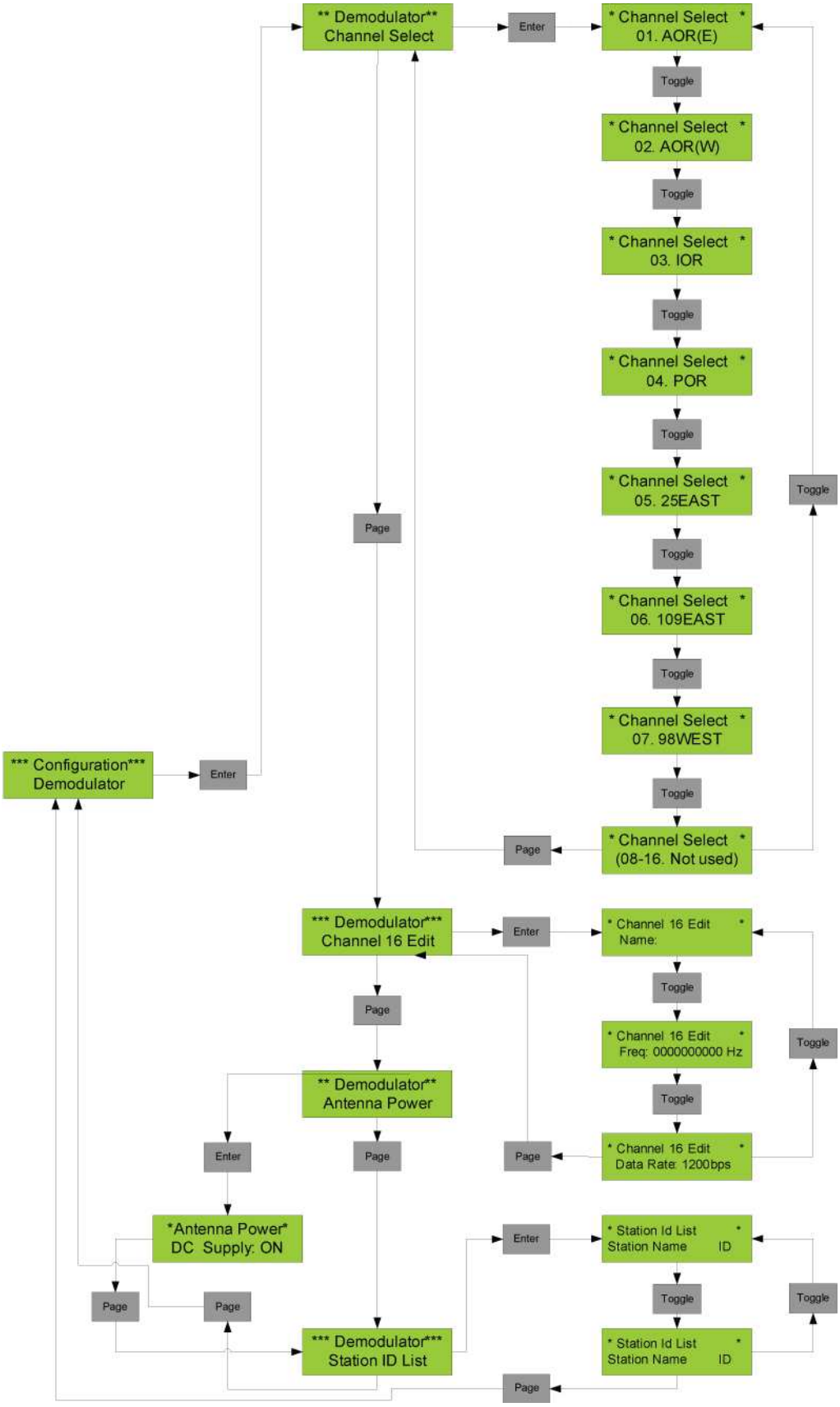
2.7.1.1 Main menu



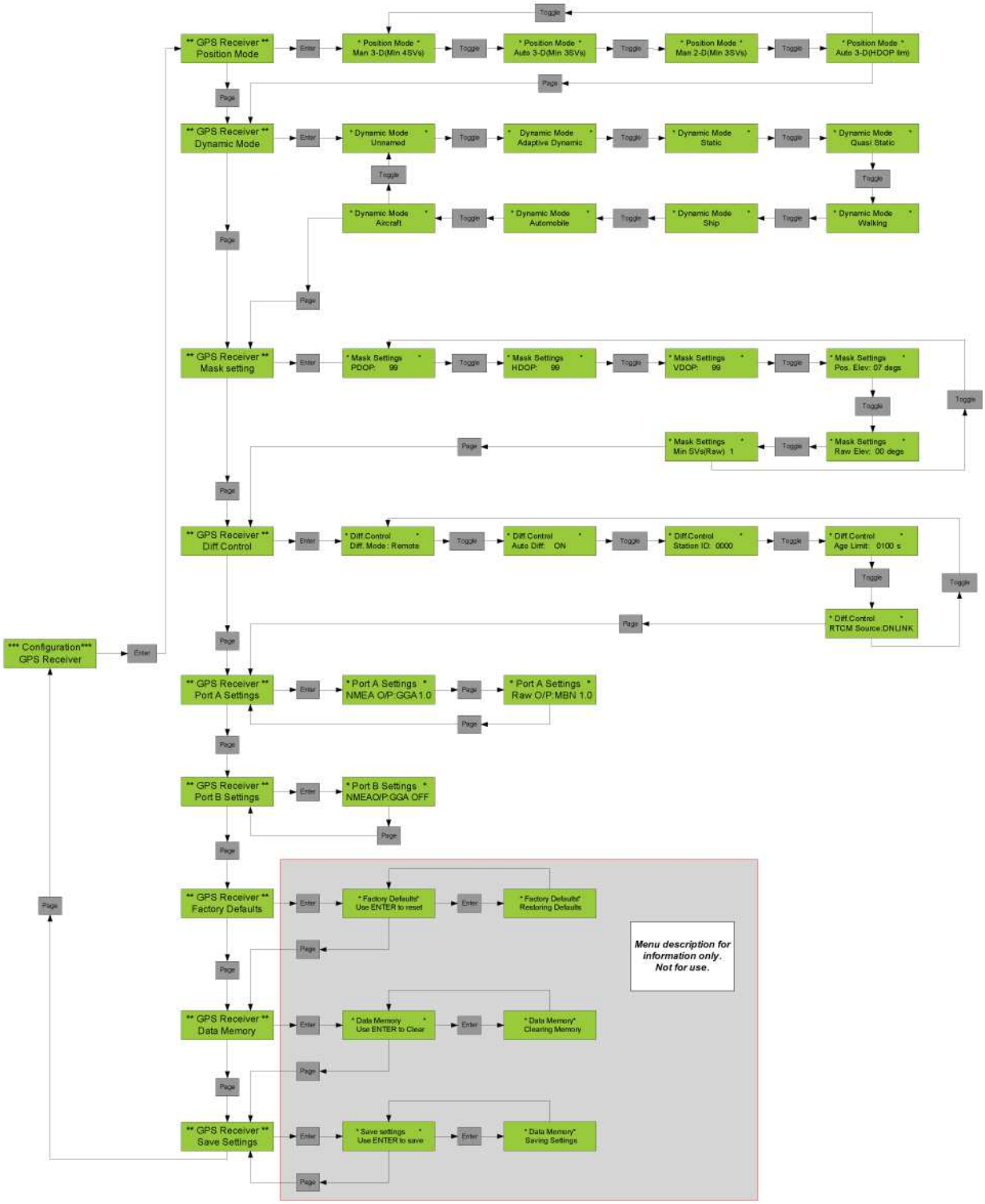
2.7.1.2 Configuration



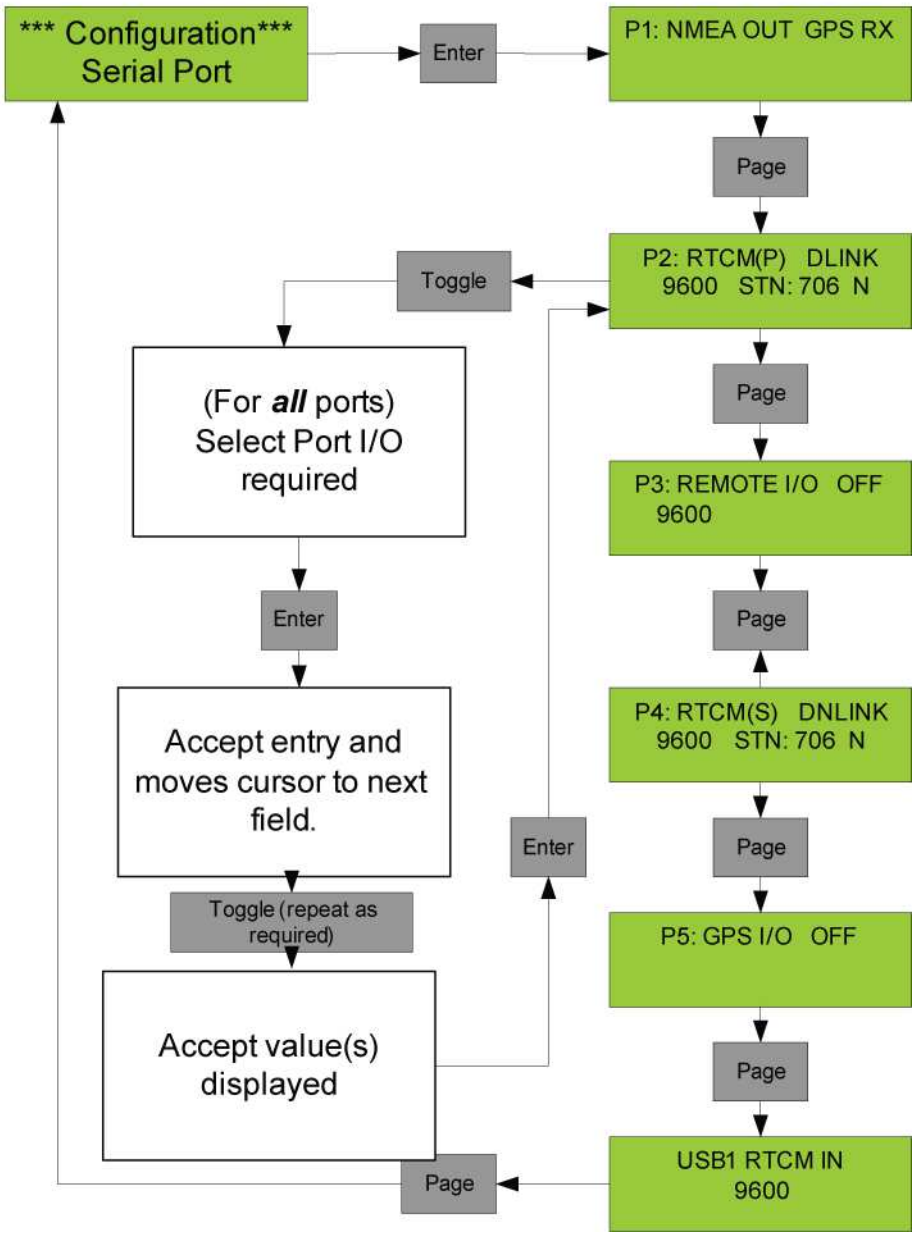
2.7.1.3 Configuration – Demodulator



2.7.1.4 Configuration – GPS


*** Configuration*** GPS Receiver
** GPS Receiver ** Position Mode
* Position Mode * Man 3-D(Min 4SVs)
* Position Mode * Auto 3-D(Min 3SVs)
* Position Mode * Man 2-D(Min 3SVs)
* Position Mode * Auto 3-D(HDOP lim)
** GPS Receiver ** Dynamic Mode
* Dynamic Mode * Unnamed
* Dynamic Mode * Adaptive Dynamic
* Dynamic Mode * Static
* Dynamic Mode * Quasi Static
* Dynamic Mode * Aircraft
* Dynamic Mode * Automobile
* Dynamic Mode * Ship
* Dynamic Mode * Walking
** GPS Receiver ** Mask setting
* Mask Settings * PDOP: 99
* Mask Settings * HDOP: 99
* Mask Settings * VDOP: 99
* Mask Settings * Pos. Elev: 07 degs
* Mask Settings * Raw Elev: 00 degs
* Mask Settings * Min SVs(Raw): 1
** GPS Receiver ** Diff Control
* Diff.Control * Diff. Mode : Remote
* Diff.Control * Auto Diff: ON
* Diff.Control * Station ID: 0000
* Diff.Control * Age Limit: 0100 s
* Diff.Control * RTCM Source:DNLINK
** GPS Receiver ** Port A Settings
* Port A Settings * NMEA O/P:GGA 1.0
* Port A Settings * Raw O/P:MBN 1.0
** GPS Receiver ** Port B Settings
* Port B Settings * NMEAO/P:GGA OFF
** GPS Receiver ** Factory Defaults
* Factory Defaults* Use ENTER to reset
* Factory Defaults* Restoring Defaults
** GPS Receiver ** Data Memory
* Data Memory * Use ENTER to Clear
* Data Memory* Clearing Memory
** GPS Receiver ** Save Settings
* Save settings * Use ENTER to save
* Data Memory* Saving Settings
Menu description for information only. Not for use.
Enter
Page
Toggle

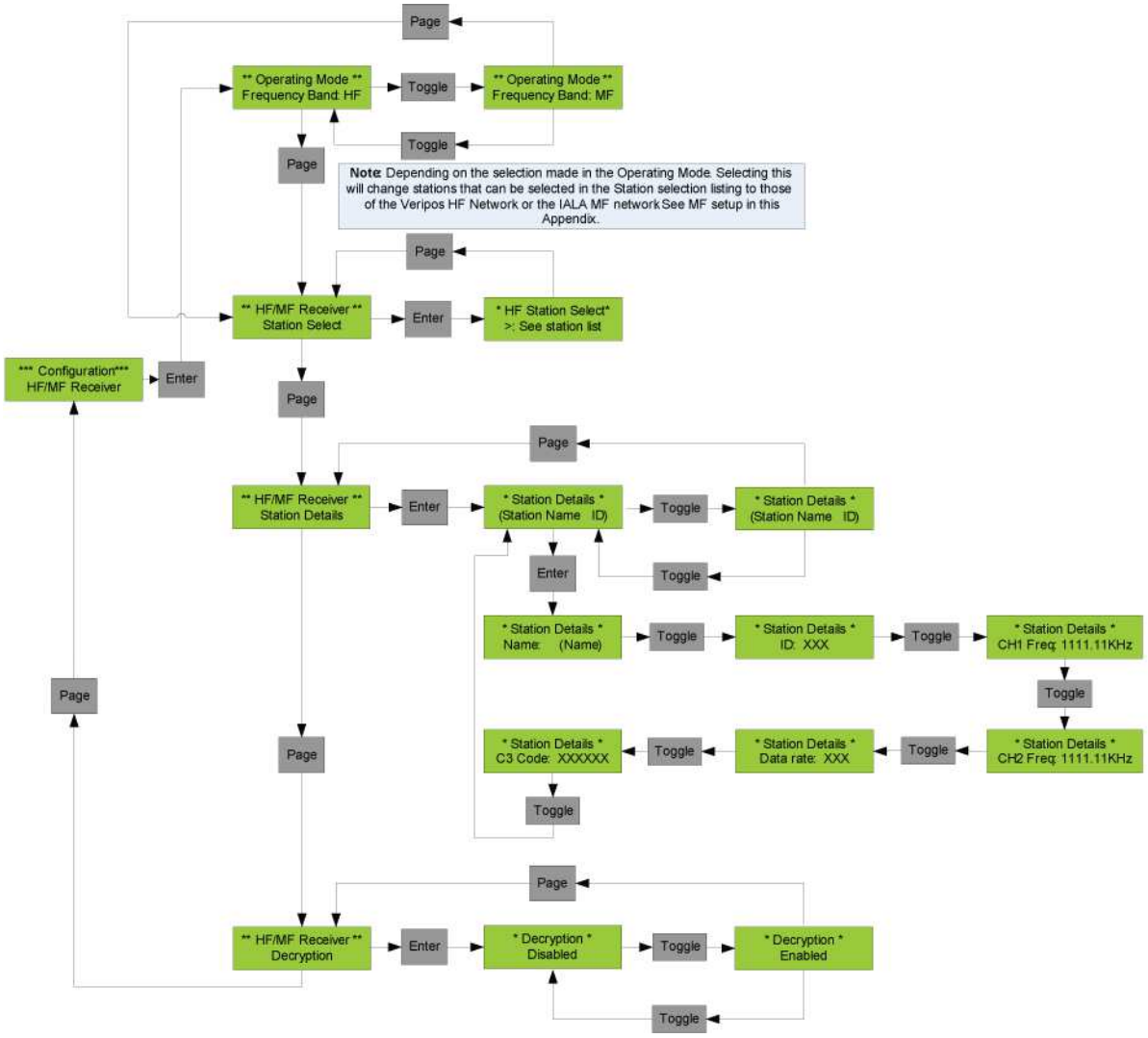
2.7.1.5 Configuration – Serial port



2.7.1.6 HF setup

NOTE

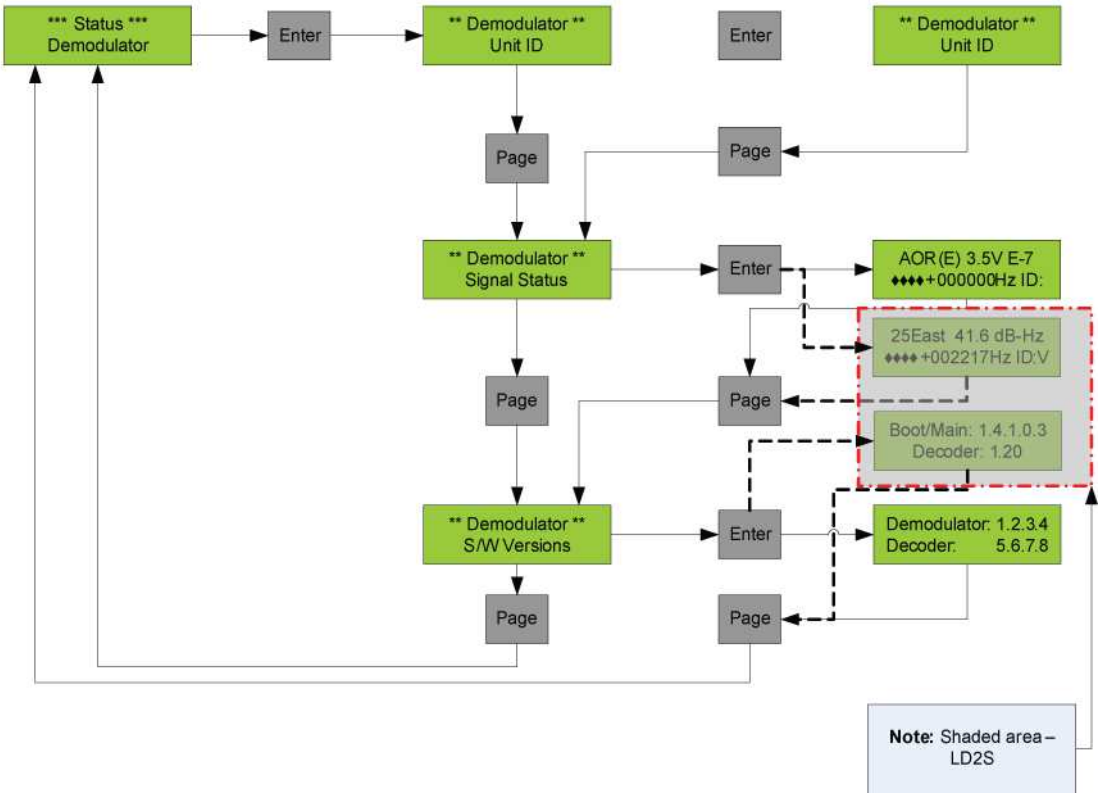
This menu is only present if the relevant HF card is installed in the LD2 variant.



2.7.1.7 Configuration – HF/MF receiver (MF setup)

NOTE

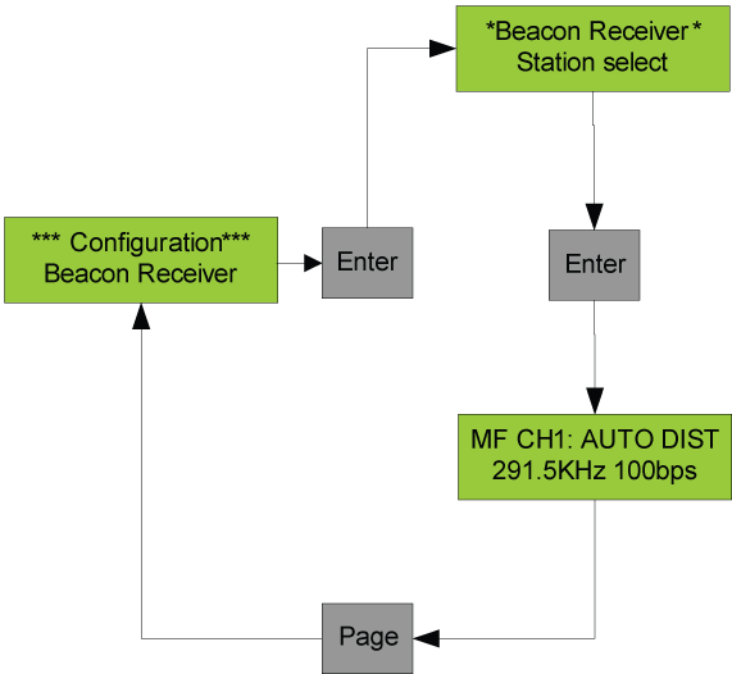
This menu is only present if the relevant MF card is installed in the LD2 Variant.



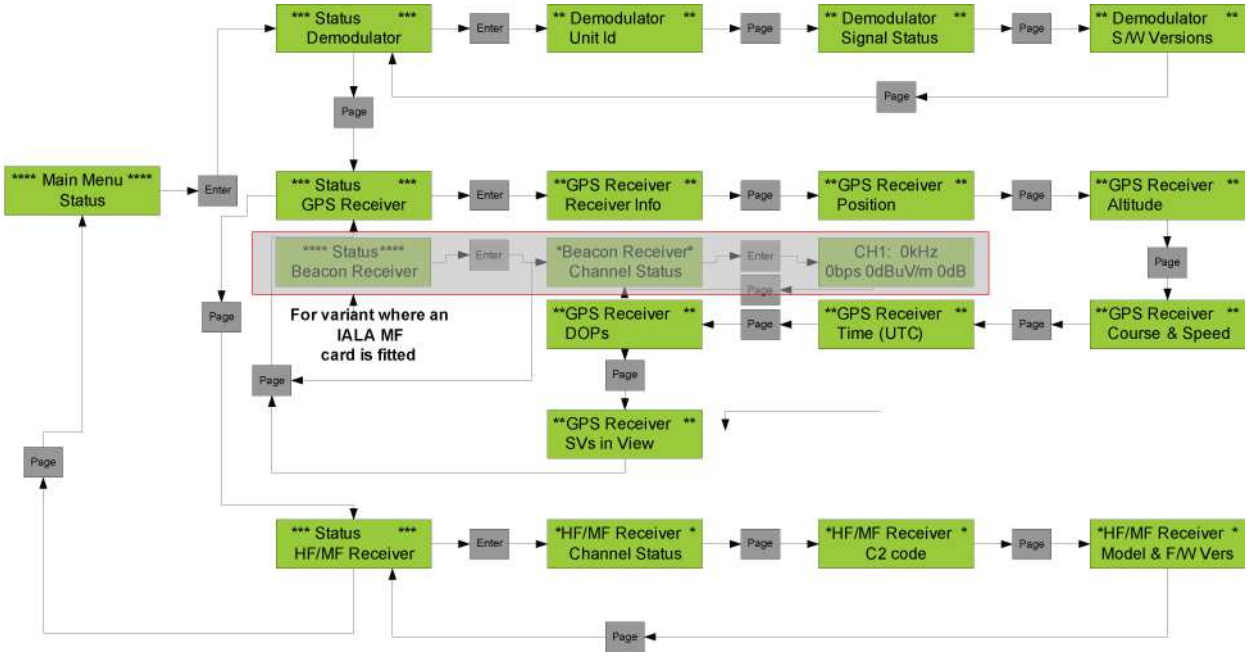
2.7.1.8 Configuration – Beacon receiver

NOTE

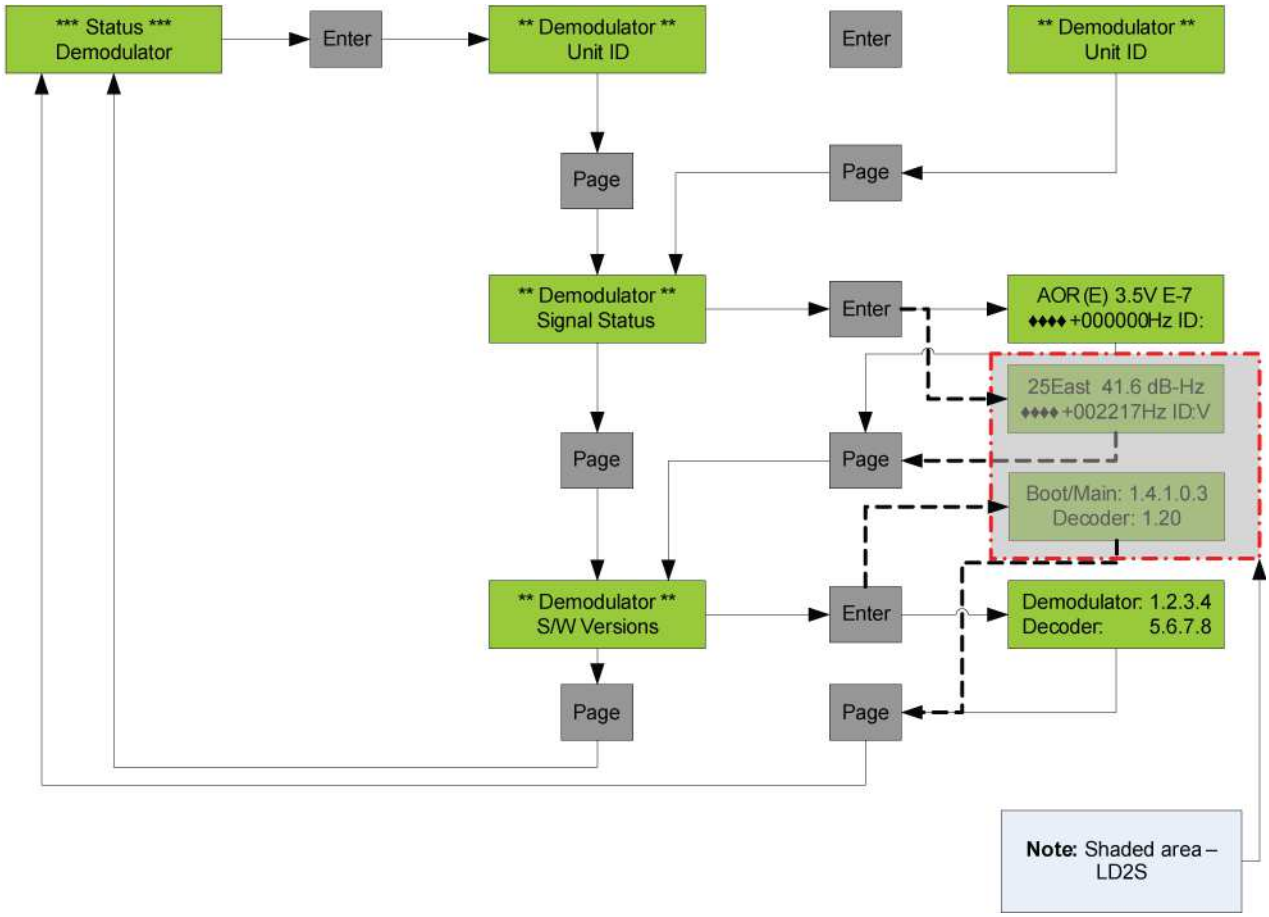
This menu is only present if the relevant MF card for IALA is installed in the LD2 Variant.



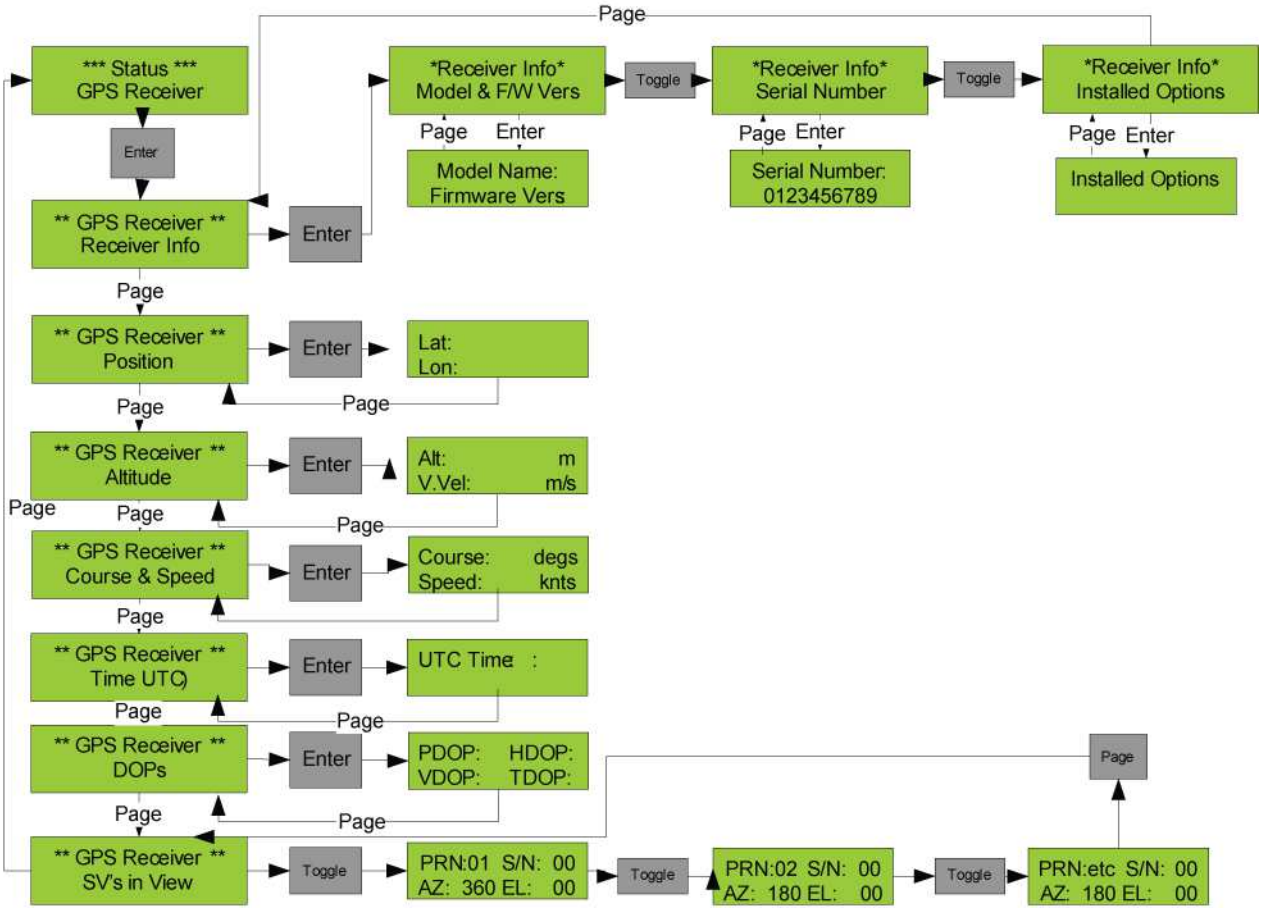
2.7.1.9 Status



2.7.1.10 Status – Demodulator

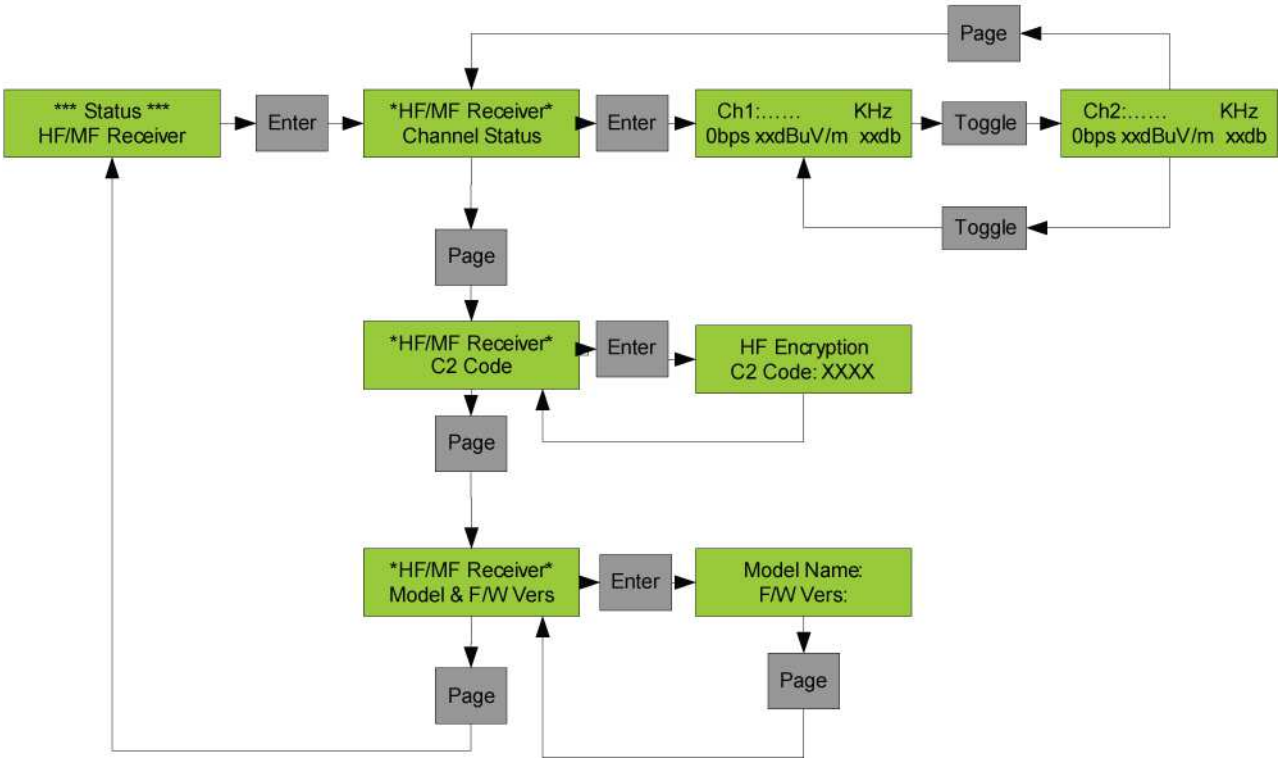


2.7.1.11 Status – GPS

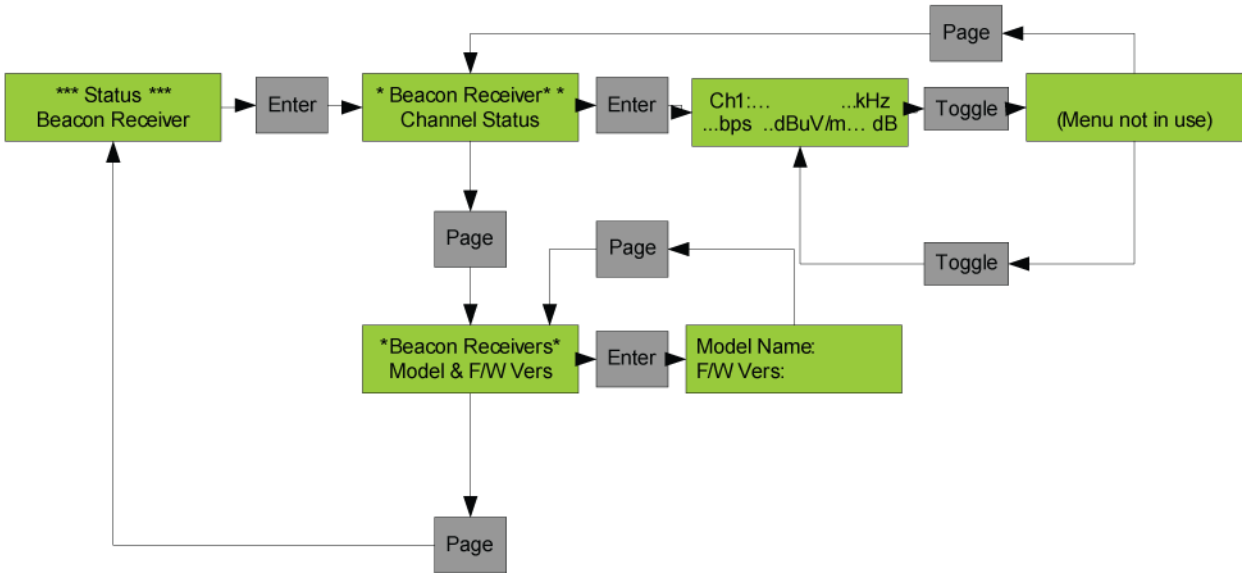


2.7.1.12 Status – HF/MF

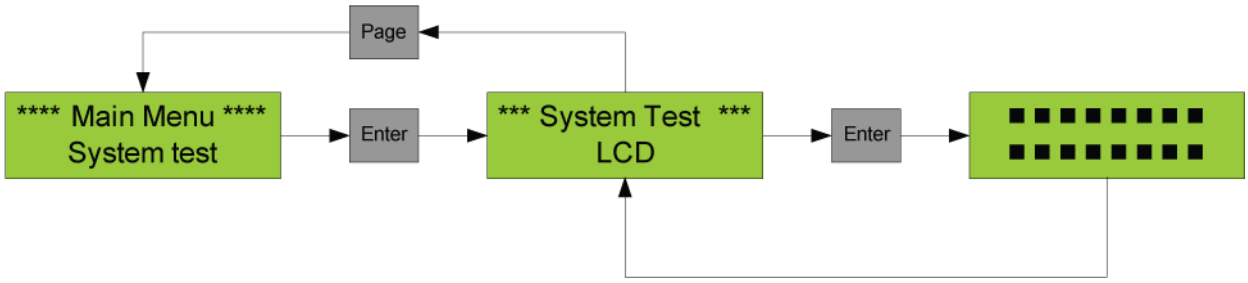
Menus are available for LD2 variant where HF/MF card installed.



2.7.1.13 Status – Beacon



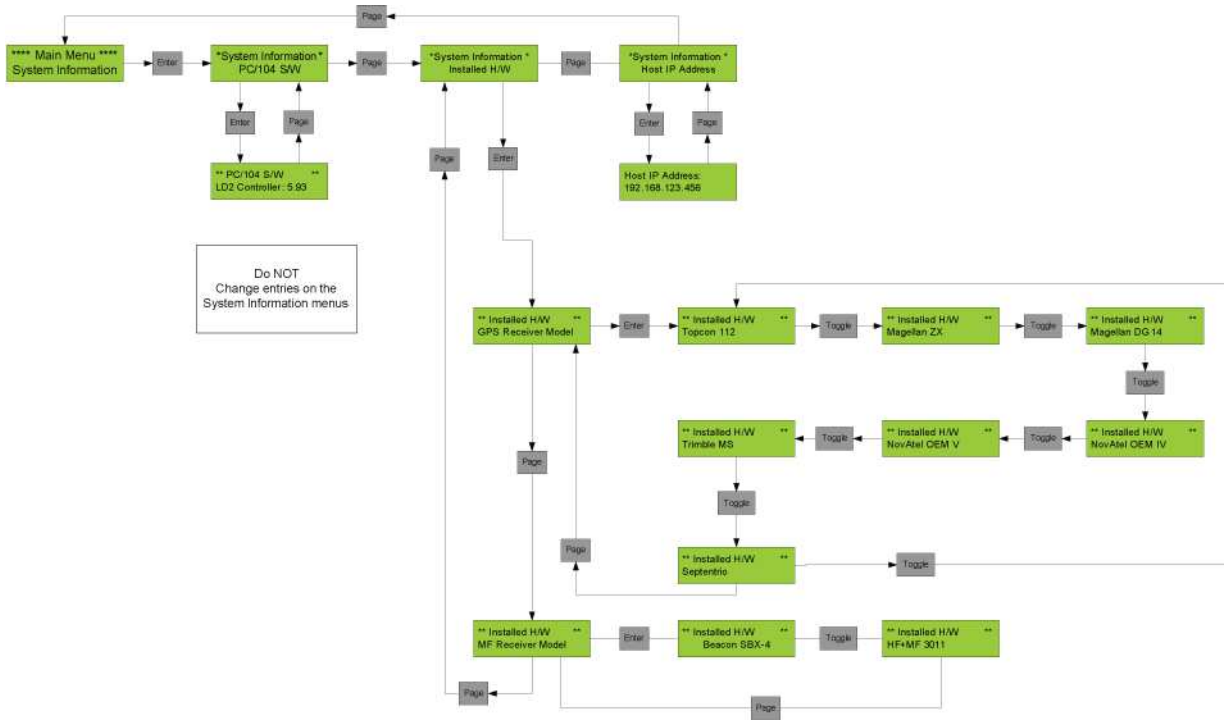
2.7.1.14 System test



2.7.1.15 System information

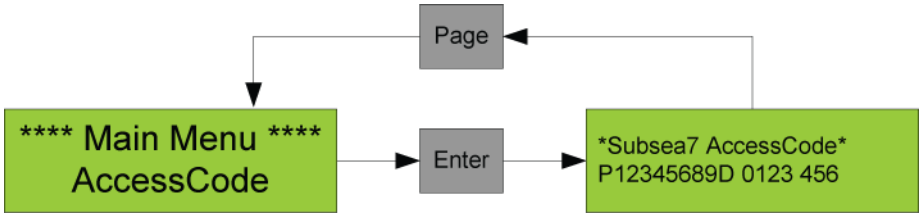
WARNING

Do NOT make changes to entries in these menus.



2.7.1.16 Access code

Refer to *section 2.3.2.2 Determine current access code*
NOTE - OVER the AIR enabling now used.



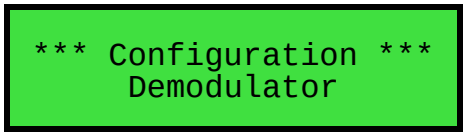
2.7.2 Configuration mode

The configuration menu allows the user to setup the different components of the LD2: Demodulator, GNSS receiver, Serial ports and HF/MF receiver. The menu maps are detailed in .

To access the Configuration menu, press the ***Page*** key until Configuration is shown in the Main menu, then press the ***Enter*** key.

2.7.2.1 Demodulator menu

From the main menu, “Configuration” screen, access the demodulator function by pressing the ***Enter*** key. The following screen is shown:



This provides access to three submenus which will allow selection of the satellite beam (channel) used to receive the VERIPOS corrections. The “user defined” submenu allows a channel frequency to be entered manually.

Channel select

VERIPOS correction data are broadcast from geostationary satellites beams (see below).

VERIPOS Satellite Downlinks

Satellite	ULTRA ID	APEX ID	Status	Power
98W	68	81	Operational	High power
AORW	68	81	Operational	High power
25E	68	81	Operational	High power
AORE	68	81	Operational	High power
IOR	68	81	Operational	High power
143.5E	68	81	Operational	High power
POR	68	81	Operational	High power

The above information is updated periodically. For the latest listing, visit: **http://help.veripos.com**

- When changing location or in areas where satellite footprints overlap, it may be necessary for the user to change to a different satellite channel (or beam).
- Sixteen channels have been allocated of which seven satellite channels have been pre-stored. This allows the user to select an appropriate channel for a region. (See section *section Figure 10. Global coverage chart*.)

To select beam:

From the main menu press ***Page*** key until “Main Menu / Configuration” is displayed:

```
**** Main Menu ****
   Configuration
```

Press ***Enter*** key to access the next menu level this will display the below screen:

```
*** Configuration ***
     Demodulator
```

Press ***Enter*** key to access the next menu level. This will display the below screen:

```
** Demodulator **
  Channel Select
```

Press ***Enter*** again to access the downlink channel table:

```
* Channel Select *
     01.AOR(E)
```

Now Press the ***Toggle*** key to step through the available downlink beams. When the desired beam is displayed, press ***Enter***. This will move the cursor to the right hand side of the screen and the letter **N** will be displayed:

```
* Channel Select *
    07.98WEST N
```

To change which beam corrections are being received press the ***Toggle*** key. This will change the character from an **N** to a **Y** and follow with ***Enter*** to confirm the change. The screen will now display:

```
* Channel Select *
 >07.      98WEST
```

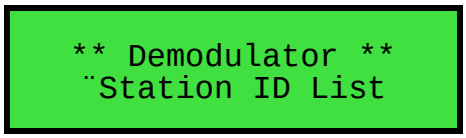
The chevron (>) indicates that this is the selected beam.

Good practice after selecting a channel/beam is to check the lock status and signal quality.

Station ID list

See section *section 2.7.5.11 Station ID listings* for a listing of the VERIPOS satellite reference stations.

Press the ***Enter*** key to select the Station ID List.



Use the ***Toggle*** key to step through the available stations on the list.

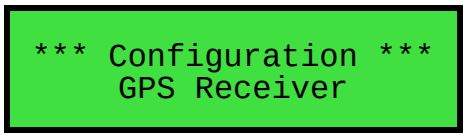
NOTE

After switching on the LD2 it may take up to 10 minutes for all reference stations accessible on the beam to become available for use in the LD2 Port setups. This is because the LD2 waits for the Type 3 message from each station before adding it to the list. Types 3's are broadcast at approximately 10 minute intervals.

2.7.2.2 GPS receiver configuration

The GPS configuration menu allows the user to change various settings within the integral GPS receiver.

From the Configuration menu, use the ***Page*** button to move to the GPS Receiver screen. Press ***Enter***. The following screen will be displayed:



This menu item provides access to the five sub menus which allow you to set parameters and options for the GPS receiver. Press the ***Enter*** key to select the first sub menu.

If the user requires access to these menus it may be necessary to temporarily set port P5 to OFF, see *section 2.3.7.2 Reconfiguring port P5*.

The following menus may only be accessed if port P5 is set to OFF.

Before making changes the user should check what is connected to port P5.

Turning the port off will disrupt the operation of any external equipment which is attached to it.

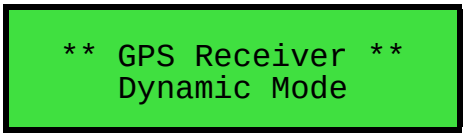
If port P5 is set to REMOTE these menus are disabled and the option to configure the GPS receiver via remote I/O from port P3 is also disabled.

Position mode

NOTE

At present these settings are not implemented in the LD2 and do not affect to the GNSS system.

Dynamic mode



NOTE

At present these settings are not implemented in the LD2 and do not affect to the GNSS system.

Mask settings

This allows the user to set the GPS receiver parameters for:

- PDOP
- HDOP
- VDOP
- Position Elevation Mask (PEM)
- Raw Elevation Mask (REM)
- Minimum SV's

The default settings are PDOP: 99, HDOP: 99, VDOP: 99, PEM: 7, REM: 0, Min SV's: 1.

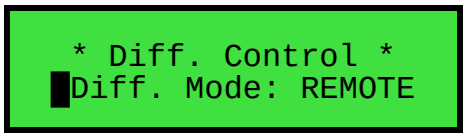
Diff control

This function is included for information only. In normal circumstances this function will not be used. It allows the user to communicate with the GPS receiver and set the “Diff Mode”, “Station ID”, “Correction Age Limit” and determine the source of RTCM data.

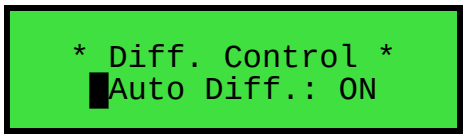
The first screen of this menu is as follows:

Pressing ***Enter*** displays the first sub-menu:

Pressing ***Enter*** displays the first sub-menu:

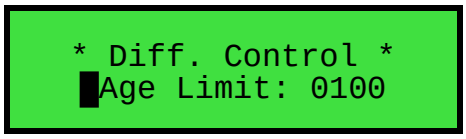


Pressing ***Toggle*** displays the second sub-menu:



Pressing ***Toggle*** again displays the third sub-menu:

Pressing ***Toggle*** displays the fourth sub-menu:



Pressing ***Toggle*** displays the fifth sub-menu:

Within each of the above sub-menus, pressing ***Enter*** moves the cursor from the extreme left of the lower line to a position immediately to the left of the current value. For "Diff Mode", the display changes as shown below:

```
* Diff. Control *
Diff. Mode: REMOTE
```

to

```
* Diff. Control *
Diff. Mode: REMOTE
```

With the cursor at the entry point, repeatedly pressing ***Toggle*** cycles through the available options. Pressing ***Enter*** selects the displayed value.

Options for each sub-menu are:

Diff Mode	REMOTE OFF
Auto Diff	ON OFF
Station ID	0000
Age Limit	0100
RTCM Source	DNLINK REMOTE LOCAL

Port A settings

This function allows the user to set up the NMEA outputs from the LD2 which are output on port P1 and port P2.

See section *section 2.7.6 NMEA 0183 messages* for format description

NOTE

For port P1, these settings determine which NMEA strings are output when the port is configured in "LOCAL" mode. If the port is in "GPS RX" mode, the strings must be selected by directly programming the GPS receiver using script files.

The first screen of this sub-menu is as follows:

```
** GPS Receiver **
  Port A Settings
```

Press the ***Enter*** key to access the first screen in the sub-menu:

```
* Port A Settings *
NMEA O/P: GGA 1.0
```

Press ***Enter*** to move the cursor to the centre of the screen (string selection mode).

Use the ***Toggle*** key to move through the list of available NMEA strings. It is possible to output multiple strings from port P1. Each string may be individually enabled or disabled.

To the right of each string ID, the display will show either “OFF” (indicating that it is disabled) or “1.0” (indicating that it is enabled for output at 1 second intervals).

To change the status of the displayed string, press ***Enter***. This will move the cursor to the right of the screen (rate selection mode).

The number displayed to the right of the cursor is the output rate for the string. To disable the string press ***Toggle*** until “OFF” is displayed. To enable the string, press ***Toggle*** until any other rate is displayed.

Press ***Enter*** to accept the entry and move back to the string selection mode.

NOTE

NMEA messages are always output at 1 second intervals regardless of the rate selected. Select “OFF” to disable the message or select any rate to enable it at 1 second intervals.

Press ***Page*** to move to the next menu:

```
* Port A Settings *
 Raw O/P: MBN 1.0
```

The screen above allows the user to output Ashtech type position strings from Port 1 and Port 2 of the LD2. (does not apply where other GPS card installed in the LD2).

Port B settings

This function allows the user to set up the NMEA outputs from the LD2 which are output on port P3.

The first screen of this sub-menu is as follows:

```
** GPS Receiver **
 Port B Settings
```

Press ***Enter*** to access the setup menu:

```
* Port B Settings *
 NMEA O/P: GGA OFF
```

Strings may be enabled or disabled in exactly the same way as described for Port A above.

Factory defaults

WARNING

NEVER use this option without first contacting the VERIPOS Helpdesk. Depending upon the model of receiver installed, the LD2 may become unusable until the GPS receiver has been re-programmed using external software.

This function allows the user to communicate with the GPS receiver to reset the unit to factory defaults but does not reset the onboard memory.

The first screen of this sub-menu is as follows:

```
** GPS Receiver **
 Factory Defaults
```

Press the ***Enter*** key to access the first screen in the sub-menu which is shown below:

```
* Factory Defaults *
> Use ENTER to reset
```

Press ***Enter*** to reset to defaults. ***See warning above!***

Data memory

WARNING

NEVER use this option except under guidance from the VERIPOS Helpdesk. The LD2 may become unusable until the GPS receiver has been re-programmed using external software.

This function allows the user to communicate with the GPS receiver to reset to factory defaults and onboard memory.

The first screen of this sub-menu is as follows:

```
** GPS Receiver **
   Data Memory
```

Press the ***Enter*** key to access the first screen in the sub-menu:

```
* Data Memory *
Use ENTER to Clear
```

Pressing ***Enter*** clears the memory and resets to defaults. ***See warning above!***

Save settings

This function allows the user to save the settings of the GPS Receiver in battery backup memory.

The first screen of this sub-menu is as follows:

```
** GPS Receiver **
  Save Settings
```

Press the ***Enter*** key to access the first screen in the sub-menu:

```
* Save Settings *
Use ENTER to Save
```

2.7.3 Serial ports configuration

NOTE

See section *section 2.10.1 I/O port details* for a listing of serial ports print-outs.

The data input/output ports are all set up from the “Serial Port” menu.

See section *section 2.7.1 Menu structure* for maps of the menus.

From the “Main menu / Configuration” screen, access the “Serial Port” configuration menu by pressing the ***Enter*** key followed by the ***Page*** key twice. The following screen is shown:

```
*** Configuration ***
    Serial Port
```

This provides access to the six sub menus which allow the user to set the parameters and options for the six serial ports.

NOTE

There are five RS-232 ports and one USB port (USB port is omitted on

some early LD2 units).

Press the ***Enter*** key to select the first page – serial port P1.

NOTE

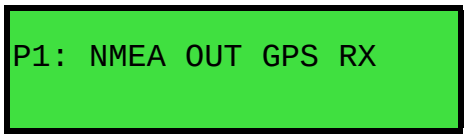
Access the other ports from here by repeatedly pressing ***Page***.

2.7.3.1 Port P1 set up

Port P1 is used to output NMEA data.

The screen below is used to select the source of the NMEA output message.

Options are “GPS RX” or “LOCAL”.



Press ***Toggle*** until the required option is displayed then ***Enter*** to select.

VERIPOS recommend using “LOCAL” as the default setting. “GPS RX” may be used if demanded by the survey specification (see notes below). Further advice may be obtained by contacting the VERIPOS Helpdesk.

NOTE

When “GPS RX” is selected the NMEA position data is computed within the GPS receiver.

When “LOCAL” is selected, the NMEA position is computed by the LD2 PC104 processor using VERIPOS algorithms.

In both cases the computation uses the RTCM corrections configured on port P2. These corrections are derived from the stations enabled during port P2 configuration.

When in “LOCAL” mode the output baud rate is fixed at **9600** baud.

In “GPS RX” mode it is possible the change the baud rate but this requires reprogramming of the GPS receiver. If the user wishes to change this setting it is advisable to contact the VERIPOS Helpdesk for assistance.

The user should now configure the NMEA output strings to be output from P1.

If “LOCAL” mode is selected, this is done using the GPS receiver port A configuration settings. Do not be confused by the menu name. Selections here configure the processor board not the GPS receiver. If “GPS RX” is required contact the VERIPOS Helpdesk for advice on configuring the GPS receiver.

Press the ***Page*** key to step to port P2 set up.

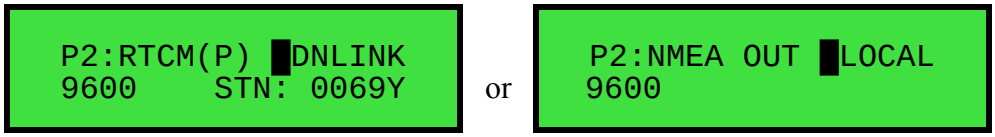
2.7.3.2 Port P2 set up

Port P2 can be used for RTCM output or for NMEA position output.

When used for NMEA positions, it outputs the same NMEA strings which are selected for port P1 (see above) but the baud rate can be changed.

RTCM output configuration is covered in detail in section *section 2.3.8 Configuring RTCM output ports*. This includes an explanation on how to choose which reference stations should be enabled.

Depending on the existing configuration the display may show either of the displays below:



Note that the cursor is positioned on the top line, allowing the output type to be selected.

To change the output type, press ***Toggle*** until the required option is displayed then press ***Enter*** to confirm the choice.

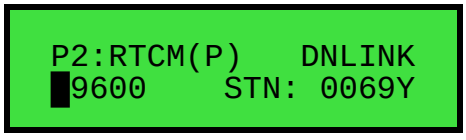
It is necessary to select "RTCM DNLINK" first even when the port will be used for NMEA output.

NOTE

RTCM settings are **not accessible** once the NMEA mode is selected so must be configured first.

When used for NMEA position output the RTCM output settings must still be configured, as these determine which RTCM correction messages are passed to the internal GPS receiver and internal processor. The internal processor uses an onboard algorithm to compute multi-reference DGPS and/or Ultra position solutions for output on port P1 (in LOCAL mode) and for use in Verify DP.

Press ***Enter*** from the "RTCM DNLINK" display to move the cursor to the bottom line and enable baud rate selection:

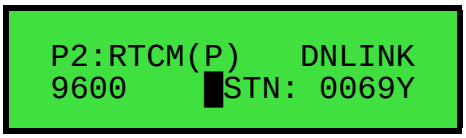


Use the ***Toggle*** key to step through the options which are:
1200, 2400, 4800, 9600, 19 200 and 38 400.

Press the ***Enter*** key to confirm the selection.

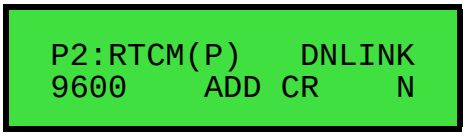
String Format

Pressing the ***Enter*** key after selecting the baud rate moves the cursor to the left of "STN:"



The user can choose to terminate the RTCM output string with a line feed (LF) or carriage return (CR).

Press ***Toggle*** to display the CR status as shown below:



The final **N** indicates that CR is disabled.

Pressing ***Toggle*** again displays a similar screen for LF.

Pressing ***Toggle*** for a third time, reverts to the original (STN: 0069Y) display.

To change the status of either CR or LF, press ***Enter*** from the appropriate screen. The cursor will move to the left of the final character. The ***Toggle*** key will then toggle the value between Y and N. Press ***Enter*** to accept.

NOTE

The option described above is omitted from some models of the LD2S.

When both entries are as required press ***Toggle*** to return to original (STN: 0069Y) display. Now press ***Enter*** to move to the reference station selection point:

Reference stations

The default setup for port P2 is to output all RTCM messages.

NOTE

Only reference stations received from the L-band input are available on port P2 and port P4. If the unit receives HF/MF corrections, these are only output on the Ethernet port.

See port details in section *section 2.10.1 I/O port details*.

Select which of the available reference stations should be included in the RTCM data used for internal computations and also (where selected) output on port P2.

NOTE

When using VERIPOS Ultra or Apex service a solution can only be computed if the Ultra/Apex “station ID” is enabled. Ultra and Apex are available worldwide, however the channel ID needs to match the beam selected.

The Ultra and Apex ID’s are shown in section 2.7.5.10

Use ***Toggle*** to step through the available stations.

The stations have the suffix “N” or “Y” after the station number. The character “N” indicates that data for that station is being received by the unit but that it has NOT been selected for output on port 2. To output the data on port P2 press the ***Enter*** key when that appropriate station is shown and then using the ***Toggle*** key to change from **N** (not selected) to **Y** (selected). Press the ***Enter*** key to confirm the selection.

This completes configuration of the RTCM string as required for use by the internal processor.

Where user requires a NMEA output from the port the output mode must now be changed – as detailed at the beginning of this section.

The screen will then show:

If a different baud rate is required, press ***Enter*** to move the cursor to the second line of the display then proceed as detailed above for RTCM.

2.7.3.3 Port P3 set up

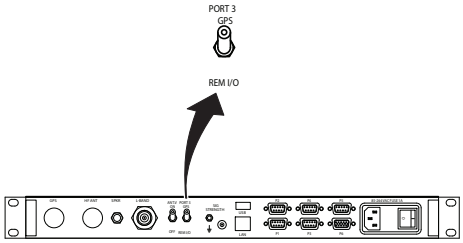


Figure 9. Port 3 Switch on the Back of the LD2

Port 3 on the LD2 can be used for multiple inputs and outputs.

```
P3:REMOTE I/O OFF
9600
```

Output raw GPS

To output raw GPS data on serial port P3 the “Port 3” switch on the back of the LD2 must be in the “GPS” position. In this configuration the menu selections under “P3 Setup” have no effect.

Note that the “Port 3” switch is not fitted to earlier units.

Configure GPS card

To configure the GPS receiver, the “Port 3” switch on the back of the LD2 must be in the “REM I/O” position.

From the above display, repeatedly press ***Toggle*** until “GPS” is displayed then press the ***Enter*** key.

The cursor will move to the lower line of the display, which shows the baud rate. Repeatedly press the ***Toggle*** key until the required baud rate is displayed then press ***Enter***.

The GPS receiver is configured via port P3 using the utility software provided by the manufacturer. This will vary, depending on which type of receiver is installed.

Output NMEA messages

NMEA type messages can be output from port P3. The “Port 3” switch on the rear of the LD2 must be in the “REM I/O” position. The port P3 settings on the front panel should be set to “SKT”. When the screen above is displayed use the ***Toggle*** key until “SKT” is displayed and press the ***Enter*** key.

To select the NMEA strings to be output, see the “GPS Port B” setup in the previous section.

Input for external RTCM

External RTCM messages can be input from an external device into port 3 for use within the internal algorithms. The “Port 3” switch on the rear of the LD2 must be in the “REM I/O” position. The port P3 settings on the front panel display should be set to “SKT”. When the screen above is displayed use the ***Toggle*** key till “SKT” is displayed and press the ***Enter*** key. Select the appropriate baud rate by pressing the ***Toggle*** until the required baud rate is displayed. Press the ***Enter*** key. The cursor moves to the right hand side of the screen. Press the ***Toggle*** key until “RTCM” is displayed, then press the ***Enter*** key to confirm the selection.

To output NMEA messages at the same time as input of external RTCM by using a Y-cable to split the outgoing data and incoming data. For details, see the LD2 Installation Manual.

Input of gyro data

When using Verify DP v2.0.5 or above, software gyro messages can be input from an external device into port P3 (also via the USB port – see later).Inputs are displayed on the Verify DP Target monitoring screen.

The “Port 3” switch on the rear of the LD2 must be in the “REM I/O” position. The port P3 settings on the front panel should be set to “SKT” when the screen above is displayed. Use the ***Toggle*** key until “SKT” is displayed and press the ***Enter*** key. Select the appropriate baud rate by pressing ***Toggle*** to select the required baud rate, then press the ***Enter*** key. The cursor moves to the right hand side of the screen. Press the ***Toggle*** key until “GYRO” is displayed then press the ***Enter*** key to confirm selection.

It is possible to output NMEA messages at the same time as inputting external gyro when using a Y-cable to split the outgoing data and incoming data. For details, see the LD2 Installation Manual.

Upload of new demodulator firmware

NOTE

Firmware upload should only be carried out by the VERIPOS workshop personnel.

A different, more complex procedure is required for LD2S units.

Using port P3 it is possible to upload new firmware to the L-band demodulator card. Move the “Port 3” switch on the rear of the LD2 to the “REM I/O” position, port P3 settings on the front panel display set to “OEM”.

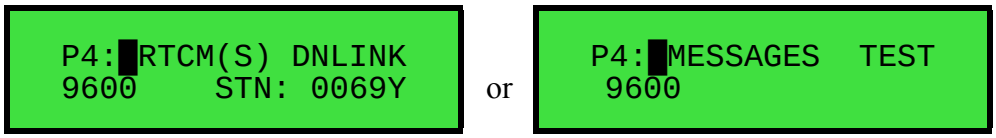
Firmware is uploaded using the VERIPOS OEM software.

2.7.3.4 Port P4 set up

The main function of port P4 is output of RTCM data.

It has the capability to output messages for use by Verify QC software and also by the VERIPOS workshop.

Depending on current configuration the entry screen may be either of the displays below:



Toggle to switch between these two displays.

RTCM DNLINK

RTCM output is configured from this display. Options to set baud rate, select string format (optional string terminators) and individual reference stations to be included/excluded.

The configuration procedure is identical to that used for port P2, as described in section *section 2.7.3.2 Port P2 set up*.

NOTE

Although the configuration procedure is identical to that used for port P2 there is a slight difference in the way the ports operate.

For port P4, stations must be enabled manually.

For port P2, all stations are automatically enabled when a new beam is selected. (Exception is for older LD2 units.)

Messages

Press ***Enter*** from within the “MESSAGES” display to move the cursor to the right of “MESSAGES”.

Toggle key is used to step between options.

The options are: TEST, MON, OFF, BCAST.

NOTE

For LD2S units: Only the “MESSAGES TEST” option is available.

Press *Enter* to move cursor directly to baud rate selection field.

The purpose of each option is as follows:

- **TEST** outputs diagnostic information concerning the demodulator performance (signal-to-noise ratio, bit error rate, frequency offset etc.). Messages are output at one-minute intervals and are mainly used to provide demodulator status information to VERIPOS Verify QC software.
- **MON** outputs a proprietary message on port P4 of the enabled or disabled status of all user codes. This is used for the VERIPOS Network Control Centre monitoring purposes.
- **OFF** sets port P4 outputs off.
- **BCAST** outputs broadcast messages to a terminal or printer. The messages are transmitted by the VERIPOS Network Control Centre and provide information on the network status, e.g. any problems with reference stations, unhealthy satellites.

Pressing ***Enter*** accepts the displayed option and moves the cursor to the baud rate selection field.

Baud rate

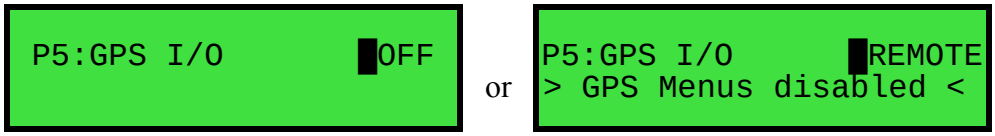
Press ***Toggle*** to step through the options which are:
1200, 2400, 4800, 9600, 19 200 and 38 400.

Press ***Enter*** to confirm the selection.

2.7.3.5 Port P5 set up

Port P5 is used for a direct external connection to the I/O port of the GPS receiver board.

Depending on current configuration the entry screen may be either of the displays below:



Press the ***Toggle*** key to switch between “REMOTE” and “OFF”, then press the ***Enter*** key to select it.

NOTE

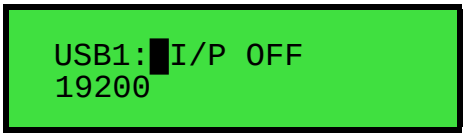
Where REMOTE is selected for direct connection to the GPS receiver via port P5 the option to configure the GPS receiver via the “Remote I/O Port P3” is disabled.

As shown in the above display the GPS menus are also disabled when “REMOTE” is selected.

The port must therefore be **temporarily turned off** in order to configure NMEA outputs, configure the GPS receiver or check GPS status.

2.7.3.6 USB set up

The rear panel USB connector may be used for inputting either external RTCM data or NMEA heading data from a gyro. The gyro data is only used by the Verify DP software.



Pressing ***Toggle*** will step through the available options which are: I/P OFF, GYRO IN, RTCM IN.

Pressing ***Enter*** will accept the displayed option and move the cursor to the bottom line to enable baud rate selection.

Pressing ***Toggle*** will step through the available options which are: 1200, 1800, 2400, 4800, 9600, 19 200 and 38 400.

Pressing ***Enter*** will accept the displayed option.

NOTE

Because of inherent limitations on USB cable length, a USB-to-serial converter is usually required. These converters use a software driver. A specific model is required to ensure compatibility with firmware of the LD2 processor.

VERIPOS recommend the AMPLICON USB-232U. It requires no external power and is opto-isolated making it suitable for DP fits.

Full product details are available at:
http://www.amplicon.co.uk/Data-Comms/product/RS232-USB-USB-232U-2948.cfm

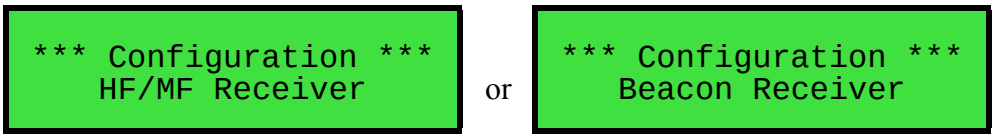
Contact the VERIPOS Helpdesk for advice and information.

HF/MF – beacon configuration

Depending on the variant model supplied the LD2 can be fitted with either of two cards to process HF/MF signals.

- **HF+MF 3001 card** is required when using VERIPOS HF stations. It can also be used with third party MF stations.
- **Beacon SBX-4 card** is supplied for clients using the MF beacon network. This card cannot receive VERIPOS HF stations.

The LD2 will display configuration menus depending upon which card is installed. (Both of these are accessed from the “Configuration” menu, see menu maps in section *section 2.7.1 Menu structure*.)



HF+MF 3001 cardBeacon SBX-4 card

2.7.3.7 HF/MF card (HF+MF 3011)

```
*** Configuration ***
   HF/MF Receiver
```

Frequency band

Press ***Enter*** from the above menu to access the “Frequency Band” selection sub-menu:

NOTE

The three sub-menus can then be accessed by repeatedly pressing ***Page***.

```
** HF/MF Receiver **
Frequency Band: HF
```

Press ***Toggle*** to change between **HF** and **MF**.

- Select **HF** when using the VERIPOS HF station network.
- Select **MF** when using third party MF corrections.

Press ***Enter*** to confirm the displayed option then ***Page*** to move to the “Station Select” sub-menu.

Station select

```
** HF/MF Receiver **
   Station Select
```

Press ***Enter*** to display the configuration sub-menu. Two different sub-menus are possible depending on the frequency band previously selected:

```
* HF Station Select *
> Den Helder     001
```

or

```
  MF CH1:  Auto Freq
299.5KHz    100bps
```

HF type display MF type display

Configuration in HF mode

In HF mode, a global list of VERIPOS HF stations will be displayed. Repeatedly pressing ***Toggle*** cycles through the complete list.

NOTE

The HF/MF card can receive data on two channels. Each VERIPOS HF station transmits corrections on two different frequencies to enhance reliability. Therefore only one station may be selected.

The currently selected station (if any) is identified by chevron (>) preceding the station name.

To select a different station press ***Toggle*** until the station name is displayed and then press ***Enter***. The cursor will move to the right of the screen and a flashing **N** will be displayed. Press ***Toggle*** to change this to a **Y** then press ***Enter***. The selected station will be selected (>). Any previously selected station will automatically be deselected.

Configuration in MF mode

NOTE

The HF/MF card can receive data on two channels. It can therefore receive two independent MF stations.

The two MF channels are displayed on separate screens. Pressing ***Toggle*** from the opening screen switches between CH1 and CH2.

Each channel provides three options for selecting stations.

1. Auto Freq – Chooses the station with the strongest signal.
2. Auto Dist – Chooses the two closest stations.
3. Manual – Allows manual selection of stations by entering frequency and data rate.

NOTE

VERIPOS strongly recommend that both channels are set to “Auto Dist” since this has been found to provide the simplest and most reliable mode of operation.

To configure: Press ***Enter*** to move the cursor to the first character of the mode name. Press ***Toggle*** until “Auto Dist” is displayed. Press ***Enter*** to confirm selection. Repeat for the other channel.

If the user wishes to use “Manual” mode, the frequency and data rate of the required station must be known. “Manual” is selected in a similar manner to “Auto Dist” but pressing ***Enter*** to confirm the selection moves the cursor to the bottom row of the display. The frequency and bit rate values must then be entered, using the ***Toggle*** and ***Enter*** keys.

HF/MF station details

NOTE

This menu is only displayed if the HF frequency band was selected.

The “Station Details” menu displays a list of attributes associated with the VERIPOS HF reference stations.

The C3 code is the decryption key required to decode the encrypted signals from the VERIPOS HF stations. Only the C3 code may be changed by the user.

The remaining values are stored in the LD2 firmware and are displayed for reference only.

Details are:

- station name
- station ID
- channel 1 frequency
- channel 2 frequency
- data rate
- **C3 code**.

From the above screen to access the code entry screen:

1. Press ***Enter*** then ***Toggle*** until the selected station is displayed.
2. Press ***Enter*** then repeatedly. ***Toggle*** until the following screen is displayed:

The C3 code is obtained from the VERIPOS Helpdesk and is the decryption key required to decode the encrypted signals from VERIPOS HF stations.

Different codes are required for different stations.

In order for the Helpdesk to provide a C3 code, the user must supply the unique C2 code associated with his particular LD2.

Use the “HF/MF Status Menu” to obtain the C2 code as described in section *section 2.3.2.2 Determine current access code*.

See section *section 2.10.2 Signal access licence and service notification form* for procedures information on service access licence (SAL) and use of the signal notification form (SNF).

NOTE

VERIPOS Helpdesk can only issue enable codes if a service access license (SAL) exists and the license number can be determined.

Licenses must be pre-arranged between the user's company and the VERIPOS Operations department.

Requests for enable/disable codes should be made using the signal notification form (SNF). This should be submitted, by email, to the VERIPOS Helpdesk at:

helpdesk@veripos.com

Blank forms are available from the VERIPOS online support web site:

http://help.veripos.com

NOTE

If necessary, enable requests can also be submitted by telephone to the VERIPOS Helpdesk. See section *section 2.7.2 Configuration mode* for current contact details.

Before calling, please refer to a signal notification form and ensure that all the required information is available.

Enter a C3 code as follows:

From the above screen, press ***Enter***. This moves the cursor to the first digit of the code entry field. Repeatedly press ***Toggle*** until the required character is displayed. Press ***Enter*** to accept the entry and move to the next digit. Repeat this process until the complete code has been entered.

Decryption

NOTE

This menu is only displayed if the HF frequency band was selected. The MF option is a free service and no decryption is necessary.

Press ***Toggle*** to switch between **Enabled** and **Disabled**. Press ***Enter*** to accept the displayed option.

NOTE

VERIPOS HF stations are encrypted using the C2 and C3 code. There are also free to air HF stations that do not use encryption. When a free to air station is being used the decryption needs to be switched off. VERIPOS cannot guarantee availability and system performance of third party stations as these are not controlled by VERIPOS.

2.7.3.8 Beacon receiver

NOTE

This menu will only appear if the optional beacon SBX-4 card is installed.

```
*** Configuration ***
   Beacon Receiver
```

The beacon receiver is capable of receiving corrections from stations in the MF IALA beacon network. The SBX-4 card will have a two beacon channel option, while a single channel applies to the 3001 card. Card selection in the installed hardware menu must be correct for the menus to display single or dual channel.

Station selection

From the above screen, press ***Enter*** to display:

```
** Beacon Receiver **
    Station Select
```

Press ***Enter*** again to display the configuration menu:

```
  MF CH1:AUTO DIST
  291.5KHz  100bps
```

The beacon receiver card has three modes of operation:

- Auto Distance – selects the closest station to the users current location
- Auto Frequency – selects station with the strongest signal strength at the users location
- Manual – allows the user to enter the frequency and bit rate of a station.

NOTE

VERIPOS strongly recommend using “Auto Distance” since this has been found to provide the simplest and most reliable mode of operation.

This is configured as follows: Press ***Toggle*** until “Auto Dist” is displayed then press ***Enter*** to confirm selection.

If the user wishes to use “Manual” mode, the frequency and data rate of the required station must be known. Press ***Toggle*** until “Manual” is displayed. Pressing ***Enter*** to confirm the selection moves the cursor to the bottom row of the display. The frequency and bit rate values must then be entered, using the ***Toggle*** and ***Enter*** keys.

2.7.4 Unit status

The “Status” menu allows the user to view the systems operational parameters for the onboard components and system details. The menu structure is outlined in section *section 2.7.1 Menu structure*.

```
**** Main Menu ****
      Status
```

2.7.4.1 Demodulator status

The demodulator status page gives the user details of the demodulator card ID, the signal status and the firmware versions on the card.

Unit ID

The first screen shown in this sub menu is as shown below:

```
*** Status ***
  Demodulator
```

Press the ***Enter*** key to access the first screen shown below:

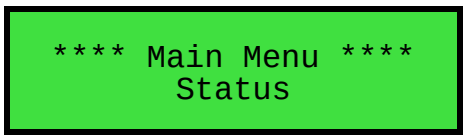
```
** Demodulator **
     Unit ID
```

This shows the unit ID and that the unit status (“Enabled” or “Disabled”). If the unit is disabled, it will have to be enabled by obtaining the appropriate access code from the VERIPOS Network Control Centre. Note that the actual code displayed will be dependent upon the receiver unit.

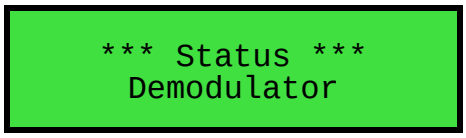
Press the ***Page*** key to enter the next sub menu.

Signal status

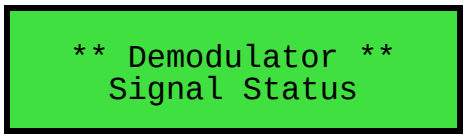
The signal status gives information on the quality of the signal and signal lock of the selected down link. See Appendix to check the status of the downlink beam, from the main menu press ***Page*** until the screen displays:



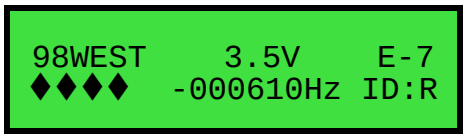
Press ***Enter*** and the screen will display:



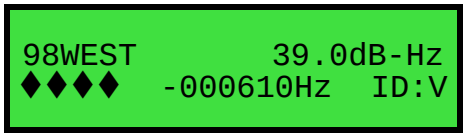
Press ***Enter*** again, followed by ***Page*** and the screen will show:



Press ***Enter*** to access the “Signal Status” page. This display is for an **LD2** unit only:



This display is for an **LD2S** unit only:



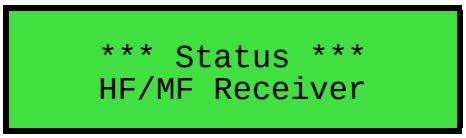
See section *section 2.3.3 Checking demodulator status* for a detailed explanation of the display information.

2.7.4.2 HF/MF receiver status

NOTE

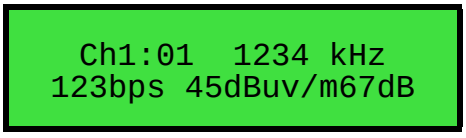
This menu is only present in an LD2 variant containing HF+MF 3001 card.

The HF/MF receiver status page gives the user details of the HF/MF receiver cards ID, the signal status for channel 1, channel 2 and the firmware versions on the card.



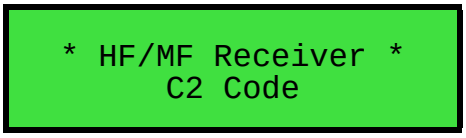
Channel status

Press the ***Enter*** key to access the sub menu and the ***Toggle*** key to toggle between channel 1 and channel 2. The channel status menu gives details for both channel 1 and 2 for the frequency's being used, the bit rate (bps), the signal strength for the current channel (dBuv/m) and the channels calculated signal to noise ratio (db).



Example status display.

C2 code



The C2 code is a unique code that is associated with the HF card. This value is needed to generate the C3 code, see section *section 2.7.3.7 HF/MF card (HF+MF 3011)* and menu maps in section *section 2.7.1 Menu structure*.

Model and F/W version

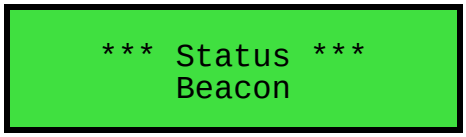
On entry to the “Model & F/W Vers” page the screen will display the receiver type and the current firmware version for the HF/MF card.

2.7.4.3 Beacon status

NOTE

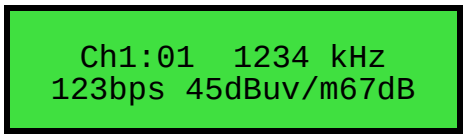
This menu is only present in an LD2 variant containing beacon SBX-4 card.

The beacon receiver status page gives the user details for the beacon signal status for channel 1 and firmware version on the SBX-4 card.



Channel status

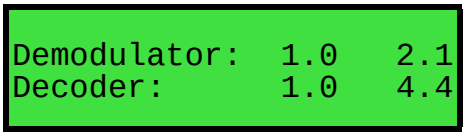
Press the ***Enter*** key to access the sub menu and the ***Toggle*** key to toggle between channel 1 and channel 2. The “Channel status” menu gives details for both channel 1 and 2 (for SBX-4 internal use only) on the frequency's being used, the bit rate (bps), the signal strength for the current channel (dBuv/m) and the channels' calculated signal to noise ratio (db).



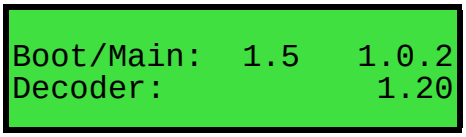
Software version

Initial screen:

Press ***Enter***. For **LD2**, the display will be similar to that shown below:



For **LD2S**, the display will be similar to that shown below:



NOTE

Some service options are only available with specific firmware versions.

VERIPOS Helpdesk may request the user to report the installed versions before issuing enable codes.

2.7.5 GPS receiver menu

The GPS receiver menu information is only accessible when port P5 is switched off (see section *section 2.3.7.2 Reconfiguring port P5*).

2.7.5.1 Receiver information

Press the ***Enter*** key to view the status page. The information below is displayed:

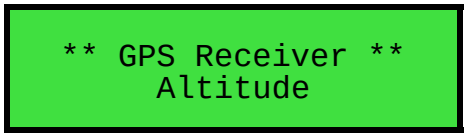
- model and firmware version
- serial number
- installed options (currently not implemented).

2.7.5.2 Position

Press the ***Enter*** key to view the status page. The information below is displayed:

- latitude
- longitude.

2.7.5.3 Altitude



Press the ***Enter*** key to view the status page. The information below is displayed:

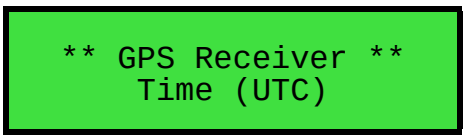
- altitude
- vertical velocity.

2.7.5.4 Course and speed

Press the ***Enter*** key to view the status page. The information below is displayed:

- course and speed.

2.7.5.5 Time (UTC)



Press the ***Enter*** key to view the status page. The information below is displayed:

- UTC time.

2.7.5.6 DOP

Press the ***Enter*** key to view the status page. The information below is displayed:

- PDOP
- HDOP
- VDOP
- TDOP.

2.7.5.7 SV's in view

Press the ***Enter*** key to view the status page. The information below is displayed:

- PRN
- signal to noice (S/N)
- azimuth (A/Z)
- elevation (EL).

Press ***Toggle*** to page through all the SV's in view.

2.7.5.8 VERIPOS station listings

VERIPOS reference stations are listed below.

The listing is up to date at time of publication.

The latest VERIPOS station listing can be found on the VERIPOS online support system:

http://help.veripos.com

2.7.5.9 IALA beacons

A listing of IALA MF stations is available from:

http://site.ialathree.org/

Select "IALA Lists of Radionavigation Services".

VERIPOS accept no responsibility for use of correction signals provided by third parties with VERIPOS equipment.

2.7.5.10 VERIPOS Ultra / APEX ID's

Service	Station ID	NMEA Station ID
Ultra	68	0068
Ultra2	68+75	0268
APEX	81	0081
APEX2	81+ 82	0281

2.7.5.11 Reference stations

This list is valid at time of production (September 2013).

The Veripos reference station ID's and beam transmission information are listed and updated regularly on VOSS at:

http://help.veripos.com

Please consult the Station table for latest information.

HF stations

Station ID	Name	Type	Beam			Service Type			Comments
			1	2	3	Std	Std+	Std2	
HF Stations									
12	Lagomar	HF				x			
14	Carmen	HF				x			

North & Central America stations

Station ID	Name	Type	Beam			Service Type			Comments
			1	2	3	Std	Std+	Std2	
501	Houston	GPS	98W	AORW		x	x		
502	Baton Rouge	GPS, GLO	98W	AORW		x		x	
503	Carmen	GPS	98W	AORW		x	x		
504	Trinidad	GPS, GLO	98W	AORW		x	x	x	
505	St Johns	GPS, GLO	98W	AORW		x		x	
506	Halifax	GPS	98W	AORW		x			
509	Tampa	GPS	98W	AORW		x	x		
510	Tampico	GPS, GLO	98W	AORW		x	x	x	
511	Costa Rica	GPS	98W	AORW		x	x		
512	Curacao	GPS	98W	AORW		x	x		
513	Fairbanks	GPS, GLO	98W	POR		x		x	

South America stations

Station ID	Name	Type	Beam			Service Type			Comments
			1	2	3	Std	Std+	Std2	
601	Rio de Janeiro	GPS	AORW	98W		x	x		
602	Macae	GPS, GLO	AORW	98W		x	x	x	
603	Catu	GPS	AORW	98W		x	x		
604	Belem	GPS	AORW	98W		x	x		
605	Natal	GPS, GLO	AORW	98W		x	x	x	
606	Porto Alegre	GPS	AORW	98W		x	x		
607	Buenos Aires	GPS	AORW	98W		x	x		
608	Lima	GPS	AORW	98W		x	x		
609	Chiclayo	GPS	AORW	98W		x	x		
610	Falklands	GPS	AORW	98W		x			

NWECS stations

Station ID	Name	Type	Beam			Service Type			Comments
			1	2	3	Std	Std+	Std2	
701	Wick	GPS	AORE			x			
702	Netherlands	GPS	25E	AORE		x			
703	Bodo	GPS	25E	AORE		x			
704	Kristiansund	GPS, GLO	25E	AORE		x		x	
705	Tananger	GPS	25E	AORE		x			
706	Falmouth	GPS, GLO	25E	AORE		x		x	
708	Bologna	GPS	25E	AORE		x			
709	Cyprus	GPS	25E	AORE		x	x		
710	Marbella	GPS	25E	AORE		x	x		
712	Vardo	GPS	25E	AORE		x			
713	Ny Alesund	GPS	25E	AORE		x			
714	Malta	GPS, GLO	25E	AORE		x	x	x	
717	Hammerfest	GPS	AORE			x			
716	Stockholm	GPS	25E	AORE		x			
777	Aberdeen	GPS	25E	AORE		x			

African stations

Station ID	Name	Type	Beam			Service Type			Comments
			1	2	3	Std	Std+	Std2	
801	Luanda	GPS	25E	AORE		x	x		
802	Malongo	GPS	25E	AORE		x	x		
803	Port Harcourt	GPS	25E	AORE		x	x		
804	Lagos	GPS	AORE			x	x		
805	Accra	GPS	25E	AORE		x	x		
806	Las Palmas	GPS	25E	AORE		x	x		
807	Cape Verde	GPS, GLO	25E	AORE		x	x	x	
808	Cape Town	GPS, GLO	25E	AORE		x	x	x	
809	Gabon	GPS	AORE			x	x		
810	Walvis Bay	GPS	25E	AORE		x	x		
812	Mozambique	GPS	25E	IOR		x	x		
813	Dar es Salaam	GPS, GLO	25E	IOR		x	x	x	
814	Sao Tome	GPS, GLO	25E	AORE		x	x	x	

Caspian and Middle East stations

Station ID	Name	Type	Beam			Service Type			Comments
			1	2	3	Std	Std+	Std2	
901	Baku	GPS, GLO	25E	IOR		x		x	
902	Aktau	GPS	25E	IOR		x			
904	Bahrain	GPS	25E	IOR		x	x		
905	Dubai	GPS, GLO	25E	IOR		x	x	x	
906	Mumbai	GPS, GLO	143.5	IOR		x	x	x	
907	Kolkata	GPS	143.5	IOR		x	x		
908	Chennai	GPS, GLO	143.5	IOR		x	x	x	

Far East stations

Station ID	Name	Type	Beam			Service Type			Comments
			1	2	3	Std	Std+	Std2	
301	Singapore	GPS, GLO	143.5E	POR	IOR	x	x	x	
302	Labuan	GPS	143.5E	POR	IOR	x	x		
303	Jakarta	GPS	143.5E	POR	IOR	x	x		
304	Balikpapan	GPS	143.5E	POR	IOR	x	x		
305	Bangkok	GPS	143.5E	POR	IOR	x	x		
306	Shenzhen	GPS	143.5E	POR	IOR	x			
307	Shanghai	GPS	143.5E	POR	IOR	x			
309	Kushiro	GPS	143.5E	POR		x			
310	Sakhalin	GPS, GLO	143.5E	POR		x		x	
311	Kemamam	GPS	POR			x	x		
313	Manila	GPS, GLO	109E	POR	IOR	x	x	x	
315	Seoul	GPS	109E	POR		x			

Australian and New Zealand stations

Station ID	Name	Type	Beam			Service Type			Comments
			1	2	3	Std	Std+	Std2	
401	Darwin	GPS	143.5E	POR	IOR	x	x		
402	Broome	GPS, GLO	143.5E	POR	IOR	x	x	x	
403	Dampier	GPS	143.5E	POR	IOR	x	x		
404	Perth	GPS	143.5E	POR	IOR	x			
406	Melbourne	GPS	143.5E	POR		x			
408	Hobart	GPS, GLO	143.5	POR		x		x	
409	Auckland	GPS, GLO	143.5E			x		x	
411	Dunedin	GPS	143.5E	POR		x			

2.7.6 NMEA 0183 messages

2.7.6.1 GGA

Essential fix data which provides 3D location and accuracy information.

```
$GPGGA,123519,4807.038,N,01131.000,E,1,08,0.9,545.4,M,
46.9,M,08,1004*47
```

GGA data message defined:

GGA	Global positioning system fix data.
123519	Fix taken at 12:35:19 UTC.
4807.038,N	Latitude 48°07.038' N
01131.000,E	Longitude 11°31.000' E
Fix quality	0 = invalid 1 = GPS fix (SPS) 2 = DGPS fix 3 = PPS fix 4 = real time kinematic 5 = float RTK 6 = estimated (dead reckoning) (2.3 feature) 7 = manual input mode 8 = simulation mode.
08	Number of satellites being tracked.
0.9	Horizontal dilution of position.
545.4,M	Altitude, meters, above mean sea level.
46.9,M	Height of geoid (mean sea level) above WGS84 ellipsoid.
08	Time in seconds since last DGPS update.
1004	DGPS station ID number.
*47	Checksum data, always begins with *.

If the height of the geoid is missing then the altitude should be suspect. Some non-standard implementations report altitude with respect to the ellipsoid rather than geoid altitude. Some units do not report negative altitudes at all. This is the only sentence that reports altitude.

2.7.6.2 GGX

Essential fix data which provides 3D location and accuracy information identical to the GGA string structure with increased accuracy in the latitude and longitude from 5 decimal points to 7 decimal points.

```
$GPGGX,123519,4807.0381234,N,01131.0001234,E,1,08,0.9,
545.4,M,46.9,M,08,1004*47
```

GGX data message defined:

GGX	Global positioning system fix data.
123519	Fix taken at 12:35:19 UTC.
4807.0381294,N	Latitude 48°07.0381294' N
01131.0001234,E	Longitude 11°31.0001234' E
Fix quality	0 = invalid 1 = GPS fix (SPS) 2 = DGPS fix 3 = PPS fix 4 = real time kinematic 5 = float RTK 6 = estimated (dead reckoning) (2.3 feature) 7 = manual input mode 8 = simulation mode.
08	Number of satellites being tracked.
0.9	Horizontal dilution of position.
545.4,M	Altitude, meters, above mean sea level.
46.9,M	Height of geoid (mean sea level) above WGS84 ellipsoid.
08	Time in seconds since last DGPS update.
1004	DGPS station ID number.
*47	Checksum data, always begins with *.

If the height of the geoid is missing then the altitude should be suspect. Some non-standard implementations report altitude with respect to the ellipsoid rather than geoid altitude. Some units do not report negative altitudes at all. This is the only sentence that reports altitude.

2.7.6.3 GLL

Geographic latitude and longitude is a holdover from Loran data and some old units may not send the time and data active information if they are emulating Loran data. If a GPS is emulating Loran data they may use the LC Loran prefix instead of GP.

```
$GPGLL,4916.45,N,12311.12,W,225444,A,*31
```

GLL data message defined:

GLL	Geographic position, latitude and longitude.
4916.45,N	Latitude 49°16.45' N.
12311.12,W	Longitude 123°11.12' N.
225444	Fix taken at 22:54:44 UTC.
A	Data A (active) or V (void).
*31	Checksum data, always begins with *.

2.7.6.4 VTG

Velocity made good.

```
GPVTG,054.7,T,034.4,M,005.5,N,010.2,K*33
```

VTG data message defined:

VTG	Track made good and ground speed.
054.7,T	True track made good (degrees).
034.4,M	Magnetic track made good.
005.5,N	Ground speed, knots.
010.2,K	Ground speed, kilometers per hour.
*33	Checksum data, always begins with *.

Note that, as of the 2.3 release of NMEA, there is a new field in the VTG sentence at the end just prior to the checksum. Receivers that don't have a magnetic deviation (variation) table built in will null out the Magnetic track made good.

2.7.6.5 GSA

GPS DOP and active satellites. This sentence provides details on the nature of the fix. It includes the numbers of the satellites being used in the current solution and the DOP. DOP (dilution of precision) is an indication of the effect of satellite geometry on the accuracy of the fix. It is a unitless number where smaller is better. For 3D fixes using four satellites a 1.0 would be considered to be a perfect number, however for overdetermined solutions it is possible to see numbers below 1.0.

There are differences in the way the PRN's are presented which can effect the ability of some programs to display this data. For example, in the example shown below there are five satellites in the solution and the null fields are scattered indicating that the almanac would show satellites in the null positions that are not being used as part of this solution. Other receivers might output all of the satellites used at the beginning of the sentence with the null field all stacked up at the end.

This difference accounts for some satellite display programs not always being able to display the satellites being tracked. Some units may show all satellites that have ephemeris data without regard to their use as part of the solution but this is non-standard.

```
$GPGSA,A,3,04,05,,09,12,,,24,,,,,2.5,1.3,2.1*39
```

GSA data message defined:

GSA	Satellite status.
A	Auto selection of 2D or 3D fix (M = manual).
3	3D fix - values include: 1 = no fix 2 = 2D fix 3 = 3D fix.
04,05	PRN's of satellites used for fix (space for 12).
2.5	PDOP (dilution of precision).
1.3	HDOP (horizontal dilution of precision).
2.1	VDOP (vertical dilution of precision).
*39	Checksum data, always begins with *.

2.7.6.6 GSV

Satellites in view shows data about the satellites that the unit might be able to find based on its viewing mask and almanac data. It also shows current ability to track this data.

Note that one GSV sentence only can provide data for up to four satellites and thus there may need to be three sentences for the full information. It is reasonable for the GSV sentence to contain more satellites than GGA might indicate, since GSV may include satellites that are not used as part of the solution. It is not a requirement that the GSV sentences all appear in sequence. To avoid overloading the data bandwidth some receivers may place the various sentences in totally different samples since each sentence identifies which one it is.

The field called SNR (signal to noise ratio) in the NMEA standard is often referred to as signal strength. SNR is an indirect but more useful value than raw signal strength. It can range from 0 to 99 and has units of dB according to the NMEA standard, but the various manufacturers send different ranges of numbers with different starting numbers so the values themselves cannot necessarily be used to evaluate different units. The range of working values in a given in the GSV string will usually show a difference of about 25 to 35 between the lowest and highest values, however 0 is a special case and may be shown on satellites that are in view but not being tracked.

```
$GPGSV,2,1,08,01,40,083,46,02,17,308,41,12,07,344,39,
14,22,228,45*75
```

GSV data message defined:

GSV	Satellite in view.
2	Number of sentences for full data.
1	Sentence 1 (of 2).
08	Number of satellites in view.
01	Satellite PRN number.
40	Elevation (degrees).
083	Azimuth (degrees).
46	SNR – higher is better for up to four satellites per sentence.
*75	Checksum data, always begins with *.

2.7.6.7 RMC

NMEA has its own version of essential gps pvt (position, velocity, time) data. It is called RMC, the recommended minimum, which will look similar to:

```
$GPRMC,123519,A,4807.038,N,01131.000,E,022.4,084.4,
230394,003.1,W*6A
```

RMC data message defined:

RMC	Recommended minimum sentence C.
123519	Fix taken at 12:35:19 UTC.
A	Status A (active) or V (void).
4807.038,N	Latitude 48°07.038’ N.
01131.000,E	Longitude 11°31.000’ E.
022.4	Speed over the ground in knots.
084.4	Track angle in degrees true.
230394	Date – 23rd of March 1994.
003.1,W	Magnetic variation.
*6A	Checksum data, always begins with *.

Note that, as of the 2.3 release of NMEA, there is a new field in the RMC sentence at the end just prior to the checksum. For more information on this field, see the NMEA home page: **http://www.nmea.org/**

2.7.6.8 ZDA

The ZDA message is date and time.

```
$GPZDA,hhmmss.ss,dd,mm,yyyy,xx,yy*CC
```

ZDA data message defined:

hhmmss	Hour, minutes, seconds (UTC).
dd,mm,yyyy	Day, month, year.
xx	Local zone hours -13...13.
yy	Local zone hours 0...59.
*CC	Checksum data, always begins with *.

2.7.6.9 GST

The GST message contains global navigation satellite system (GNSS) pseudorange error statistics.

`$GPGST,hhmmss.ss,a.a,b.b,c.c,d.d,e.e,f.f,g.g *cc`

GST data message defined:

hhmmss	UTC time in hours, minutes, seconds of the GPS position.
a.a	Root mean square (rms) value of the standard deviation of the range inputs to the navigation process. Range inputs include pseudoranges and differential GNSS (DGNSS) corrections.
b.b	Standard deviation of semi-major axis of error ellipse (meters).
c.c	Standard deviation of semi-minor axis of error ellipse (meters).
d.d	Orientation of semi-major axis of error ellipse (meters).
e.e	Standard deviation of latitude error (meters).
f.f	Standard deviation of longitude error (meters).
g.g	Standard deviation of altitude error (meters).
*cc	Checksum data, always begins with *.

2.7.7 Global coverage chart

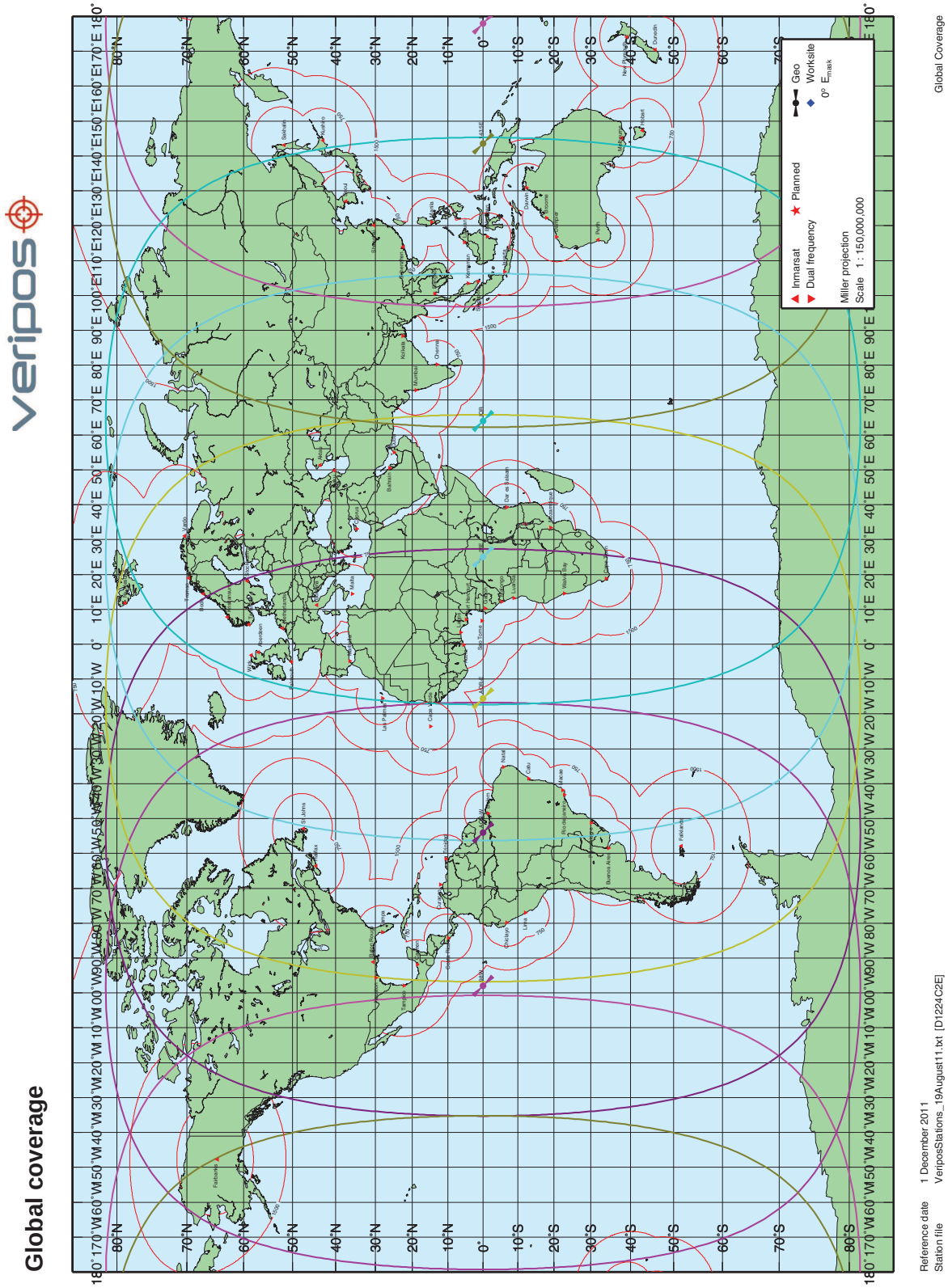


Figure 10. Global coverage chart

2.8 Bridge cards

2.8.1 LD2 – Access code

The LD2 and LD2S need to be enabled to receive VERIPOS Augmentation services before use. A service access licence (SAL) is required to be in place. For LD2S the "Sync" LED **must** be lit before using this card.

This Bridge card describes how to enable or disable your VERIPOS LD2 receiver to use VERIPOS Augmentation services.

Step 1.
Establish current status of LD2.

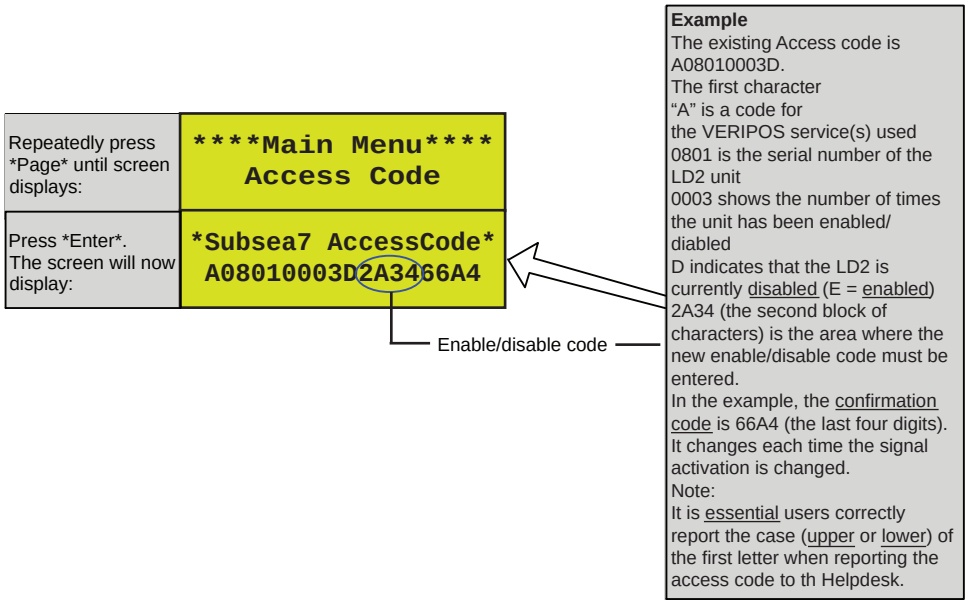
Unit status is determined from the "ID" LED on the front panel.

"ID" LED is **on and solid**: LD2 is enabled.
"ID" LED is **flashing**: LD2 is disabled.

Step 2.
Request an access code.

Confirm there is a SAL (service access licence) in place. Submit a SNF (service notification form) by email to **helpdesk@veripos.com** or call the VERIPOS Helpdesk on +44 1224 527104. A new over the air enable process applies.

Accordingly, remainder of Step 2 and Steps 3 & 4 are NO LONGER REQUIRED.


Repeatedly press *Page* until screen displays:
****Main Menu****
Access Code
Press *Enter*. The screen will now display:
Subsea7 AccessCode
A08010003D2A3466A4
Enable/disable code
Example
The existing Access code is A08010003D.
The first character "A" is a code for the VERIPOS service(s) used
0801 is the serial number of the LD2 unit
0003 shows the number of times the unit has been enabled/ diabled
D indicates that the LD2 is currently disabled (E = enabled)
2A34 (the second block of characters) is the area where the new enable/disable code must be entered.
In the example, the confirmation code is 66A4 (the last four digits). It changes each time the signal activation is changed.
Note:
It is essential users correctly report the case (upper or lower) of the first letter when reporting the access code to th Helpdesk.

Step 3.
Enable the LD2 to receive VERIPOS augmentation services.

VERIPOS Helpdesk issue a new 4-digit enable code (729C in the example below/ above).

Enter enable code into the "Access Code" screen using the ***Toggle*** and ***Enter*** keys. The 4-character confirmation code will change automatically when the access code is entered.

Report new confirmation code (42FF in the example) to the VERIPOS Helpdesk. This ensures the unit has been successfully activated.

For confirmation the “ID” LED on the LD2 front panel changes from a flashing to a **solid** light to indicate the LD2 is enabled for use.

Enable example:

Step 4.
Disable the LD2 augmentation service reception.

The LD2 receiver is disabled in the exactly the same way. Obtain a 4-digit access code from the VERIPOS Helpdesk and enter it into the unit.

In the example below the new access code is A08010004E.

Report the actual code shown to the VERIPOS Helpdesk using the SNF form. They will issue a disable code.

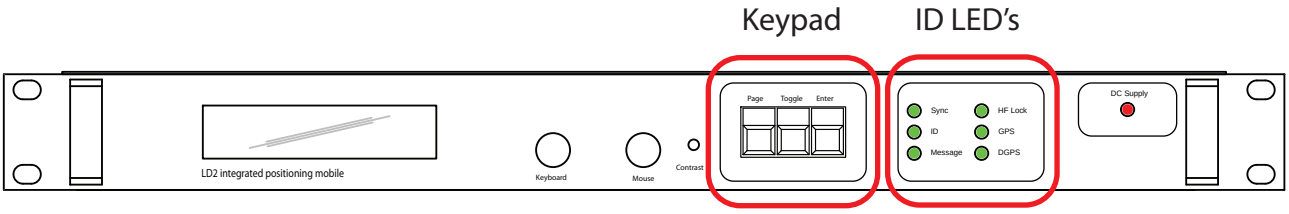
Once received, enter the 4-digit disable code into the LD2 (Step 3) and report the confirmation code back to the Helpdesk.

ALWAYS report the confirmation code to ensure correct service.

Disable example:

Copies of the Service Notification Form and more support is available from the VERIPOS VOSS **http://help.veripos.com**

LD 2 front panel highlighting the keypad and ID LED's used when enabling or disabling the LD2.



Note 1: ID lights labelling varies with model used.
Note 2: See section *section 2.3 Operating procedures* for details.

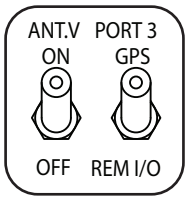
2.8.2 LD2 – Beam selection, select data channel

This Bridge card describes how to select the data channel on your VERIPOS LD2 receiver to receive VERIPOS augmentation services. Notes are included on the type of signal source to be used including use of "Fleet Broadband".

Step 1.
Confirm setting of LD2 "Ant. V" toggle switch.

OFF – set when connected to an Inmarsat antenna system.
ON – set when connected to a spot (L-band) antenna.
Do not turn antenna power on when using Inmarsat antenna source or it may cause damage to the Inmarsat terminal.

***Do not** turn antenna power on when using Inmarsat antenna source or it may cause damage to the Inmarsat terminal.*



For details on which beams may be selected by region, please refer to the VERIPOS satellite cover chart available at:

http://help.veripos.com

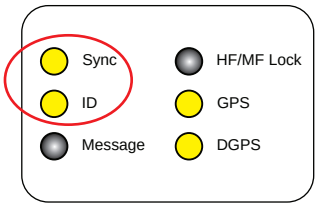
A copy is in section *section Figure 10. Global coverage chart*.

Step 2.
Select downlink beam.

The LD2 and LD2S models have different L-band cards. Follow the sequence below for your model (see LD2 front panel label).

Section *section 2.3.4 Configuring LD2 demodulator to receive corrections* in LD2 Operations manual has a detailed description.

LD2 & LD2S:
Page x (times) until "Main Menu / Configuration".
Enter 1x to "Configuration / Demodulator".
Enter 1x to "Channel Select". Enter.
Toggle x (times) until beam required, **Enter**.
Toggle from **N** to Y, **Enter**.
> chevron shows beam in use.

Step 3. LD2S antenna power switch in software.	For LD2S model only. "Antenna Power" should be turned **ON** using the front panel display menus when using an omni-directional spot antenna (90984/3/1) and **OFF** when using Inmarsat. The following steps show how to change this setting in the demodulator menus. LD2S only: **Page** x (times) to "Main Menu / Configuration". **Enter** 1x to "Configuration / Demodulator". **Enter** 1x to "Demodulator / Channel Select". **Page** 2x until "Antenna Power". **Enter** displays "Antenna Power / DC Supply: Off or On", **Enter**. **Toggle** from **N** to **Y**, **Enter**. > chevron confirms selection (Y or N).
Step 4. Check "Sync" indicator and demodulator status.	Allow time for the L-band card to acquire a lock. When the "Sync" indicator LED is lit it confirms the LD2 is receiving the selected beam. You can check the signal strength in the "Demodulator Status" menu – see section *section 2.3.3 Checking demodulator status* on how to do this.  Note: Labelling of LED's may vary with LD2 model.

2.8.2.1 Note of Fleet broadband

Fleet broadband service is available from three satellites:

- 98W (I-4 Americas)
- 25E (I-4 EAME)
- 143E (I-4 Asia-Pacific).

Fleet broadband terminals may be used instead of Inmarsat B and Fleet 77, 55 terminals.

VERIPOS reviews coverage for our services and provides users with updates to assist when selecting services and cover for operational regions. See the VERIPOS VOSS for updates at:

http://help.veripos.com

Fleet broadband services must be carefully considered when planning dual beam operations with one beam using a Fleet broadband terminal.

Example – EAME region, dual beam use

Previously, access to the AORE satellite beam could have been made using an Inmarsat terminal. Correspondingly a spot (omni) antenna would be used to receive the VERIPOS corrections from the 25E satellite beam.

Where Fleet broadband Inmarsat terminal is used, access to VERIPOS augmentation services in this region would be via the 25E satellite Beam and the high power service (using a SPOT antenna) would come from the AORE satellite beam.

2.8.3 LD2 – Configuration of RTCM port outputs

This Bridge card describes how to configure your VERIPOS LD2/LD2S receiver to output corrections in RTCM format to port P2 and optionally P4.

Output format:RTCM.

Recommended:Output all reference stations to Ports P2 and P4, then amend station list for work area.

Max station range:2500km (VERIPOS Ultra – no range limit).

Ultra service:No range limit. Ensure unit and output port to Verify QC system are enabled for Ultra.

Step 1.
Configure Ref. stations on P2.
	Default of LD2/LD2S – output RTCM at 9600 baud on P2 and P4. Refer to Operations manual if change of default settings required.
	
	Consult VERIPOS Station ID charts or use Verichart software to select which stations and their ID's you wish to use (**http://help.veripos.com**).
	
	The sequence below describes navigating to the port and then selecting the required station ID.
	
	Page x (times) to "Main Menu / Configuration".
	Enter 1x to "Demodulator".
	Page x (times) until "Serial Ports", **Enter**
	Enter 1x to show **P2** setup screen.
	Enter 1x to "Station ID".
	Toggle x to show required ref station ID
	then
	Enter and **Toggle** N to Y, **Enter** to select.
	To select next station:
	Toggle x to Station ID.
	Enter, **Toggle**, **Enter** to select.
	
	`P2: RTCM(P) DNLINK`
	`9600  STN: 505 N`

Step 2. Configure Ref. stations on P4.	As described in step1, except at “Serial Ports”, **Page** x times until P4 shown (see below): Then continue as in step 1.

2.8.4 LD2 – Configuration of position output on port P1

This Bridge card describes how to configure your VERIPOS LD2/LD2S receiver to output positions in NMEA GGA format to port P1, from either the onboard processor or the GPS receiver.

P1 port output:RS-232 at 9600 8-N-1.

NMEA output:One set of data per second.

Output selection:- “Local” – onboard processor generates NMEA output
- uses the RTCM corrections selected on P2
- “GPS Rx” the GPS card generated NMEA for output
- P5 GPS I/O must be set to “OFF”.

Recommended:Use local NMEA GGA as default setting.

Contact VERIPOS where different output string, format or baud rate required. For a detailed description see section *section 2.3.9 Configuring position output from port P1*.

Step 1. Selecting the port P1 output source.	**Page** x (times) to “Main Menu / Configuration”, **Enter**. **Page** 2x until “Serial Ports”, **Enter**. **P1** setup screen (below) will display. **Toggle** to change between LOCAL or GPS RX as required. **Enter** to confirm. **Page** to display “P2: RTCM(P)” setup screen. **Enter** 4x to move cursor to required ref station ID. **Enter** and **Toggle** N to Y. **Enter** to select. To select next station: **Toggle** to “Station ID”. **Enter**, **Toggle**, **Enter** to select. **LOCAL** mode: fixed output rate of 9600. **GPS RX** mode: output baud rate may vary.

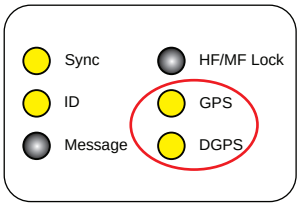
Step 2.
Config strings output for P1 in LOCAL mode.
	In LOCAL mode from the “Configure/GPS menu screen:
	Page x (times) to “Main Menu / Configuration”, **Enter**.
	Page to “Configuration GPS Receiver”, **Enter**.
	Page 4x until “Port A Settings”, **Enter**.
	Enter to sub-menu screen (below).
	Enter to “String Select” then **Toggle** through the available NMEA strings (listed below).
	Enter, **Toggle**, **Enter** to select strings to be output (“OFF”=disabled, “1.0”=output at 1 Hz).
	`* Port A Settings *`
	`NMEAO/P:GGA 1.0`
	Multiple strings may be output from P1.

Positioning messages

Message type	Description
GGA	Position fix data which provide 3D location and accuracy data.
GGX	GGA with a position accuracy at seven (7) decimal places.
GLL	Geographic latitude and longitude.
VTG	Velocity made good.
GSA	It includes the numbers of the satellites being used in the current solution and the DOP.
GSV	Satellites in view shows data about the satellites that the unit might be able to find based on its viewing mask and almanac data.
RMC	Position, velocity and time data.
ZDA	Date and time.
GRS	GPS range residuals.
GST	GPS pseudorange noise statistics.

For details of these strings, see *section 2.7.6 NMEA 0183 messages*.

GPS and DGPS lit when GGA or GGX string enabled:



Note: Labelling of LED’s may vary with LD2 model.

2.8.5 LD2 – Configuration of VERIPOS HF corrections

This Bridge card describes how to configure your VERIPOS LD2/LD2S receiver to receive corrections using the on-board HF card.

HF corrections signal quality varies with location and conditions.

To use HF corrections a C3 code must be entered. Request a C3 code from the VERIPOS Helpdesk using a SNF (signal notification form) advising the existing C2 code and region.

For a detailed description see section *section 2.3.10 Configure to receive VERIPOS HF corrections*.

Step 1.
Determine existing C2 code.

The sequence below describes navigating the LD2 menus to view the current C2 code.

Page x (times) to “Main Menu / Status”, **Enter**.
Page 2x until “Status HF/MF Receiver”, **Enter**.
Page to “HF/MF Receiver C2 Code”.
Enter to “HF/MF Receiver C2 Code:xxxxx” (below).

```
* HF/MF Receiver *
  C2 Code:XXXXX
```

Report the 5-digit C2 code to the VERIPOS Helpdesk, using the SNF (see section *section 2.10.2 Signal access licence and service notification form*.

A blank SNF is available from the VERIPOS online support web site:
http://help.veripos.com

Step 2.
Request C3 code.

Use a SNF form and ensure you report the C2 code **and** operating region.

Step 3.
Select station, entering C3 code and enable decryption.

You must have the C3 code from VERIPOS Helpdesk before starting this step.
Only **one** VERIPOS station may be selected.

Each VERIPOS station broadcasts on two frequencies to enhance reliability.

Page x (times) to “Main Menu / Configuration”, **Enter**.
Page 3x to “Configuration HF/MF Receiver”, **Enter**.
Toggle (if required) to display “HF ”, **Enter**.
Page to “HF/MF Receiver Station Select”.
Enter to show the “Station Selection” screen (below).

```
*HF Station Select*
 > Den Helder  001
```

Chevron indicates station is selected.
Press **Toggle** to move through stations and **Enter** to select. Then use **Toggle** to change **N** to **Y** and **Enter** to accept the selection.
Chevron against the station name confirms selection.

To enter C3 code and enable decryption:
Page 2x to screen below.

```
** HF/MF Receiver **
   Station Details
```

Enter to “Station Details” (same station name as you selected), **Enter** to accept then **Toggle** 5x to code entry screen (below).

```
* Station Details *
   C3 Code: ******
```

Use **Enter** and **Toggle** to move and match characters when entering 6-character C3 code you obtained from the VERIPOS Helpdesk. When entered the code is hidden (asterisks).

Press **Page** 2x to “Decryption” screen and **Toggle**, **Enter** to enable then **Enter** to accept.

Step 4.
Check HF status.

Page x (times) until “Main Menu / Status” screen displayed.
Enter, **Page** 2x to “Status HF/MF Receiver”.
Enter to show “Channel Status”, **Enter** to access sub menu (below).

```
  Ch1: 01  1234 kHz
123bps 45dBuv/m 67dB
```

Toggle between channels 1 and 2 to confirm status.

2.8.6 LD2 – Checks of equipment status

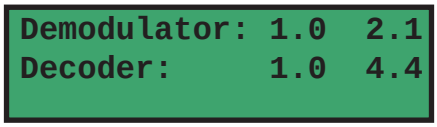
This Bridge card describes how to check the status of your VERIPOS LD2/ LD2S receiver for the status of;

- Firmware
- Demodulator
- HF
- GPS.

Step 1.
Check demodulator firmware version.

Features available may vary with the firmware installed on your LD2/LD2S. Where requested by the VERIPOS Helpdesk, check which firmware version is installed.

Page x (times) to “Main Menu / Status”.
Enter 1x to “Status / Demodulator”.
Enter 1x to “Demodulator / Unit ID”.
Page 2x to “Demodulator / Software Versions”.
Enter – Display will vary depending whether LD2/LD2S (see below).



LD2

LD2S

Step 2.
Check demodulator signal status.

When the LD2/LD2S receives corrections signal from the geostationary satellite beam (channel) for the current location, the “Sync” LED will light up. Users can then check the signal strength using the instructions below.

Page x (times) to “Main Menu / Status”.
Enter 1x to “Status / Demodulator”, **Enter**.
Page to “Demodulator / Signal Status”.
Enter – Display will vary depending whether LD2/LD2S (see below).

LD2

LD2S

The “Sync” indicator LED is lit and confirms the LD2 is receiving the selected beam. You can check the demodulator status – see the “Beam selection” Bridge card.

Step 3.
Check HF status.

Page x (times) until “Main Menu / Status” screen displayed.
Enter, **Page** 2x to “Status HF/MF Receiver”.
Enter to show “Channel Status”, **Enter** to access sub menu (below).

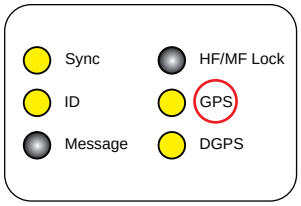
```
  Ch1: 01  1234 kHz
123bps 45dBuv/m 67dB
```

Toggle between channels 1 and 2 to confirm status.

Step 4.
Check GPS status.

GPS indicator on the front panel reports satellite status from a GGA telegram which the unit normally outputs through port P1. Flashing – indicates the number of satellites used in the position computation.

This telegram is present when using the default unit configuration. It may be disabled if certain optional configuration settings are applied. It is therefore possible for the indicator to be extinguished even when good GPS signals are present.



Note: Labelling of LEDs may vary with LD2 model.

Alternatively, GPS status may be checked using the menu:

Page x (times) until “Main Menu / Status” screen displayed.
Enter to show “Status / Demodulator”.
Page to show “Demodulator / GPS Receiver”.
Enter to view sub-menus.

Page and **Enter** cycles through sub-menus to view, including “Position”, “DOP’s” and “SV’s in View”.

2.9 Specifications

2.9.1 LD2 specifications

Mechanical

Receiver size	19 inch rack mount x 1U height x 32 cm depth.
Weight	5 kg / 11lb.
Display	2 line x 20 character back lit liquid crystal display (LCD).

Electrical

Input voltage	85 to 264 VAC.
Power consumption	20 W.
Fuse	250 V / 1A, anti surge 20 mm.

IEC 60945 EMC certified.

Demodulator

1525 to 1559 MHz input from L-band antenna or tapped.

L-band output from Inmarsat B terminals.

Acquisition time from switch on typically <20 seconds.

Re-acquisition time typically <10 seconds.

HF/MF demodulator

2 channel HF/MF demodulator in the frequency band 1.6 to 3.5 MHz.

RTCM output.

Compatible with VERIPOS standard HF and third party HF/MF transmissions.

Data interfaces

5 x RS-232 ports	Port 1: NMEA output. Port 2: RTCM (primary). Port 3: Remote I/O, NMEA output in some LD2 configurations. Port 4: RTCM (secondary). Port 5: GPS I/O, NMEA output in some LD2 configurations.

1 x VGA video output.

1 x RJ45 LAN port with full network connectivity.

1 x USB port.

Connections for optional external keyboard with touchpad or mouse.

Antenna

The GPS antenna is a right-hand circular polarised L-band frequency range with an integral low-noise amplifier. The internal thread is 5/8" x 11 UNC (standard marine mount).

PC/104 board

300 MHz geode processor.
256 Mb SDRAM.
64 Mb or 1 Gb Compact Flash card depending on program being supported.

GNSS receiver

The following optional OEM GNSS cards can be installed in the LD2:

Magellan* G12

12 channel L1 C/A code and carrier.
Strobe correlator multipath mitigation.
Standard NMEA-0183 V2.01 output.
Differential remote RTCM V2.2.
Raw data output.
1 PPS (5V TTL).
Position and raw data update rates selectable up to 10 Hz.
2 x bi-directional RS-232 serial ports up to 115200 bps.
Operating temp: -30 ℃ to +60 ℃.
Power consumption: 2.2 W.

Magellan* DG14

12 channel L1 C/A code and carrier.
2 SBAS channels (WAAS/EGNOS/MSAS).
Edge and strobe correlator multipath mitigation.
Standard NMEA-0183 V3.0 output.
Differential base and remote RTCM V2.2.
Raw data output (code and carrier).
1 PPS (5V TTL).
Position and raw data update rates selectable up to 20 Hz.
Kalman filter.
2 x bi-directional RS-232 serial ports up to 115200 bps.
Operating temp: -30 ℃ to +70 ℃.
Power consumption: 1.2 W.

Magellan* Z-Family (including ZX-Eurocard and Z-Eurocard)

36 channel, all in view parallel tracking.
12 channel L1 C/A code and carrier tracking.
12 channel L1 P-code and full wavelength tracking.
12 channel L2 P-code and full wavelength tracking.
Z-tracking.
Enhanced edge and strobe correlator.
Standard NMEA-0183 V2.3 and 3.0 output.
Raw data output (code and carrier).
1 PPS (5V TTL).
Position and raw data update rates selectable up to 10 Hz.
Differential base and remote RTCM V2.2.
4 x bi-directional RS-232 serial ports up to 115200 bps.
Operating temp: -30 ℃ to +70 ℃.
Power consumption: 7.5 W.

Magellan* GG24

24 channel GPS and GLONASS.
12 channel L1 GPS code and carrier.
12 channel L1 GLONASS code and carrier.
2 SBAS channels (WAAS/EGNOS/MSAS).
Strobe correlator multipath mitigation.
Standard NMEA-0183 V2.01 output.
Differential remote RTCM V2.2.
Raw data output (code and carrier).
1 PPS (5V TTL).
Position and raw data update rates selectable up to 2 Hz.
2 x bi-directional RS-232 serial ports up to 115200 bps.
Operating temp: -30 ℃ to +70 ℃.
Power consumption: 2.3 W.

Topcon Euro 112T

40 Channel, all in view, L1/L2 GPS, L1/L2 GLONASS and WAAS.
Advanced multipath mitigation.
Raw data output (code and carrier).
Low signal tracking (down to 30 dbHz).
2 x 1 PPS outputs (LVTTL).
Standard NMEA 0183 V2.1, 2.2, 2.3 and 3.0 outputs.
Differential remote RTCM V2.1, 2.2.
Position and raw data updates rates selectable to 20 Hz.
4 x bi-directional RS-232 serial ports up to 460800 bps.
Operating temp: -40 ℃ to +75 ℃.
Power consumption: 2.7 W typical.

Septentrio AsteRx2

66 Channel L1/L2 GPS, L1/L2 GLONASS and WAAS.
Dual-frequency L1/L2 code/carrier tracking.
PPS outputs.
NMEA v2.30 output format, up to 10 Hz.
RTCM v2.1, 2.2.
3 serial ports.
Operating temp: -40 ℃ to +70 ℃.
Power consumption: 2 W typical.

Compass safe distance

Standard	1050 mm.
Steering	750 mm

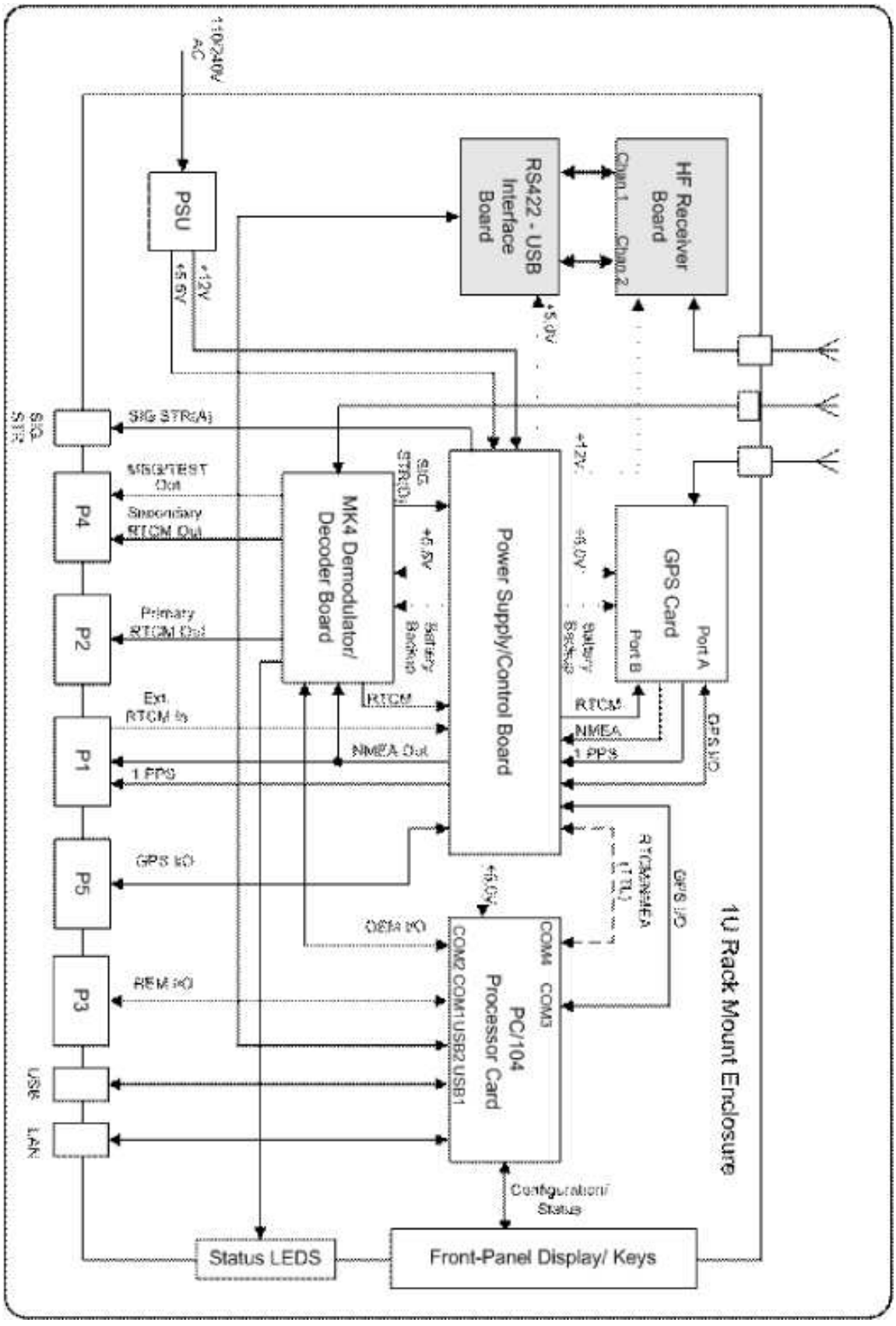


Figure 11. LD2 Layout / Wiring Schematic

2.10 GNSS, Ports, SAL and SNF

2.10.1 I/O port details

2.10.1.1 Interface and serial port information

This details the pin out details for the LD2 receiver connections.

Ports 1 to 5 on the rear panel are 9 way D-type female plus 1 USB port.

Serial port connectors have performance characteristics for RS-232.

Connectors P1 – P5 all D9 female.

LD2 I/O ports

Port	Type	Data on pins
1	RS-232	1 – 1PPS out (GPS Rx / VERIPOS) 2 – NMEA out (GPS Rx / VERIPOS) 3 – Ex RTCM in (GPS Rx) 5 – Signal ground
2	RS-232	2 – RTCM out / NMEA out (primary) 5 – Signal ground
3	RS-232	2 – Remote I/O / NMEA out (VERIPOS) 3 – Remote I/O in 5 – Signal ground
4	RS-232	2 – RTCM out (secondary) 8 – Message / Test out to Verify QC 5 – Signal ground
5	RS-232	2 – GPS out 3 – GPS in 5 – Signal ground
USB		Ext gyro in / RTCM in
LAN	10BaseT	(RJ45 convention) Port 4992 – Raw GPS[4] Port 4993 – Port 2 messages Port 9013 – NMEA out on Port A Port 9015 – NMEA out on Port B

Notes:

1. *Corrections are output in RTCM v2 format.*
2. *The MF RTCM data is only available on the LAN on socket 5994, when selected on firmware versions 5.83 and above.*
3. *Where an Ethernet connection is used the IP address of the LD2 variant should be configured in the same domain as the connected computer.*
4. *Port 4992 – only active if P5 is set to "OFF" and P1 is set to "LOCAL".*
5. *Equipment reboot off/on is reqired for LAN port changes to take effect.*

Notes on use with gyro / range and bearing

I/O configuration values to be used:

Data	Address	Port
VDP aux	127.0.0.1	5001
Gyro (HDT) serial port 3	127.0.0.1	4990
Gyro (HDT) USB	127.0.0.1	4997

2.10.2 Signal access licence and service notification form

2.10.2.1 Signal access license, SAL

VERIPOS correction signals are provided as a chargeable service.

In order to receive this service the user must first arrange a service access license (SAL). This takes the form of a contract which is agreed between the user's company and the VERIPOS Operations department.

The LD2 unit cannot be used until an enable code is obtained from the VERIPOS Helpdesk. The helpdesk is not authorised to issue a code unless an active SAL exists and its number can be determined. To avoid delays the user should keep a record of the SAL number associated with his unit.

Depending upon the contract between VERIPOS and the user's company, charges may be waived during periods when the equipment is not in use. Where this is the case the user may wish to disable the LD2 during periods of prolonged inactivity.

2.10.2.2 Service notification form, SNF

In order to enable or disable the LD2, codes must be obtained from the VERIPOS Helpdesk.

Requests for enable/disable codes should be made using the SNF (service notification form). This should be submitted, by email, to the VERIPOS Helpdesk at:

helpdesk@veripos.com

NOTE

The current version of the form can be downloaded from the VERIPOS online support web site:

http://help.veripos.com

If necessary, enable requests can also be submitted by telephone to the VERIPOS Helpdesk. See the “VERIPOS contact details” section of the Appendix for current phone numbers.

Before calling, please refer to a SNF and ensure that all the required information is available.

VERIPOS provide a range of services which are available in various combinations. When requesting an enable code, the user must specify which services are required. The full listing of services is provided on the signal notification form. The choice of services affects both pricing and system accuracy.

For more information visit the VERIPOS Web site:

http://help.veripos.com

NOTE

Some services are only available on units with specific hardware options installed.

SERVICE ACCESS INSTRUCTIONS

PLEASE DOWNLOAD THE LATEST FORM FROM VOSS, AT HTTP://HELP.VERIPOS.COM

This table removed - see SNF on VOSS

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3 Troubleshooting

The equipment is designed and manufactured to exacting standards and, once installed and operated correctly, should provide prolonged trouble-free service.

This section of the manual is intentionally brief. VERIPOS understand the pressures on workers in the offshore industry and do not believe that a printed manual can provide adequate support if problems arise.

VERIPOS encourage all users to promptly report any problems or operating queries to the VERIPOS Helpdesk so that they may receive immediate personal assistance.

The Helpdesk is manned 24 hours per day, 365 days per year. Details are given in the “Contact Information” chapter.

The duty operator is trained to provide direct assistance with the most common queries and problems. In addition, he has recourse to a range of on-call engineers and technical staff who will provide support for more complex issues.

Except in emergency situations, VERIPOS recommend initial contact is made by email to the Helpdesk or by raising a fault ticket on the Web site. This will ensure that the users contact details and the basic description of the fault are correctly recorded.

NOTE

Before calling the Helpdesk, please use the information later in this section.

To ensure a rapid response, the initial communication should include the following information:

- User's name.
- Telephone number.

If possible, choose a phone near the equipment.

- E-mail address.
- Full vessel name.

Correct identification is important; VERIPOS may have installation drawings.

- Name of parent company.
- Current “Access code” of LD2; “User code” from front of LD2 variant.
- Current status of the seven front panel indicators on the LD2.
- Brief description of other VERIPOS hardware and software installed.
- Vessel’s current operating region.
- Vessel’s status.

Is it alongside, in transit, in operation, or shut down due to fault?

- History of fault.

Is this a new installation which has not yet been fully commissioned?
Did a problem suddenly arise with a system which was previously working?
Did the system cease working after moving to a new region?

- Description of fault.

As soon as the basic information has been received, the Helpdesk operator will raise a numbered fault ticket. This will record the time and date of the original contact and it will be updated with all subsequent communications. The user can access the ticket from the VERIPOS online support site (VOSS).

The fault ticket system ensures that all communications regarding the issue are readily accessible to all parties concerned. The ticket will remain open until the user confirms that the issue has been resolved to his satisfaction. Senior VERIPOS personnel regularly review all open tickets to ensure that all necessary assistance has been provided.

There are no user-adjustable controls or user-serviceable items within the receiver.

The following diagnostic procedures enable the user to carry out simple fault finding on the system.

3.1 Power fault

Fault	Reason	Remedy
All indicators extinguished, no backlight on display.	On/Off switch to OFF.	Switch unit ON using switch on rear panel.
	Blown fuse.	Check units fuse on rear panel and replace fuse as necessary.
	Faulty supply.	Check if AC supply is available.
	Faulty power connector.	Check continuity of the power lead. Replace or repair power cable as necessary.

3.2 Enable/disable faults

Fault	Reason	Remedy
After requesting new Access Code all entries remain unchanged. (Access code reverts to previous value)	Code incorrect or wrongly entered.	Repeat request. Report problem to Help-desk – include a note of the current access code.
	Unit requires a reset.	Disconnect the power for one minute. Reconnect power and repeat code entry.
After requesting new Access Code, the access code shows a value but other entries remain unchanged.	**For LD2S only** Not receiving L-band.	LD2S units cannot be enabled or disabled unless the “Sync” indicator is illuminated. See section *3.3 L-band signal fault*.
“ID” lamp is extinguished (it should normally be illuminated, either solid or flashing).	**For LD2S only** No L-band signal has been received since the unit was switched on.	For LD2S units, the "ID" indicator is not activated until L-band signals have been received. See section *3.3 L-band signal fault* for trouble-shooting L-band faults.
The unit has been enabled for Verify DP but the monitor remains blank	Unit requires a reset.	Disconnect the power for one minute.

3.3 L-band signal fault

Fault	Reason	Remedy
SYNC indicator extinguished.	Unit requires a reset.	Switch power OFF for one minute then switch back ON. Allow a few minutes for the unit to acquire synchronisation.
	The vessel has moved to a new region but the demodulator has not been re-configured.	Check demodulator status to determine current channel selected (see procedures in the “Operation” chapter). If not appropriate for region, select new channel (see procedures in the “Operation” chapter).
	L-band signal is derived from vessel’s Inmarsat. Inmarsat has lost lock or has switched to a different satellite.	Check demodulator status to determine current channel selected (see procedures in the “Operation” chapter). Verify that the Inmarsat is tracking the same satellite.
	Antenna blockage.	Visually check whether the path between the antenna and satellite is subject to blockage (this can easily occur when the vessel is in port or alongside a large structure). Blockage can also be caused by the vessel's own superstructure. This can usually be eliminated by changing heading.
	Interference.	Investigate any source of L-band transmissions. Also high power transmissions of other frequencies. If possible, shut down possible sources to eliminate them.
	Ant. V toggle turned OFF when using SPOT antenna.	Set toggle switch to ON. **Warning**: Do **not** set to ON when connected to Inmarsat.
	Antenna disconnected or inoperative.	Visually check antenna and cable for possible damage. Check coaxial connections.

4 Contact information

All initial contacts regarding technical or support issues should be initially addressed to the VERIPOS Helpdesk. Where appropriate, the Helpdesk will refer issues to the regional operations and engineering teams.

4.1 VERIPOS UK

Prospect Road
Arnhall Business Park
Westhill
Aberdeenshire, AB32 6FE
United Kingdom

Greenwell Road
East Tullos
Aberdeen, AB12 3AX
United Kingdom

4.1.1 Helpdesk

Helpdesk telephone	+44 (0)1224 527104
Helpdesk facsimile	+44 (0)1224 748204
VERIPOS UK Operations project management	+44 (0)1224 526000
Helpdesk e-mail	helpdesk@veripos.com
VERIPOS Online support	http://help.veripos.com

NOTE

If shipping equipment back to VERIPOS, please contact the Helpdesk who will provide the current shipping address, according to the user's area of operations.

4.2 Additional VERIPOS offices:

15990 North Barker's Landing
Suite 130
Houston, Texas 77079
USA

26 Changi North Crescent
Diethelm Keller Building, #04-01
Singapore 499637

Rua do Caldeireiro
s/n Lote 10, Quadra G. Bairro Mar do Norte
Rio das Ostras, RJ
Brazil 28890-000

Calle 61 No. 5, entre 26 y 26-A Col. Revolucion
Cuidad Del Carmen, Campeche
Mexico